JANUARY 18th, 1945

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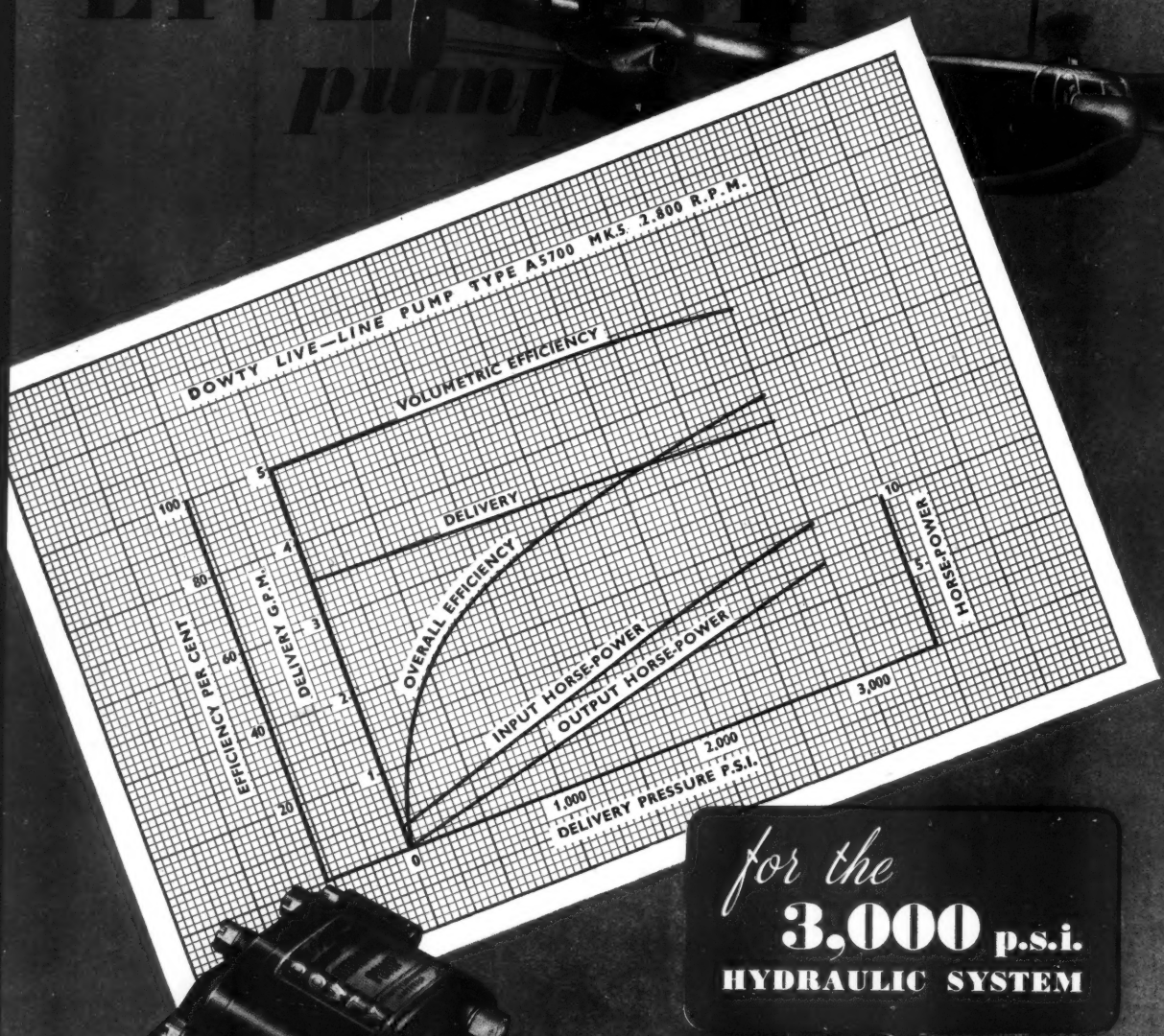

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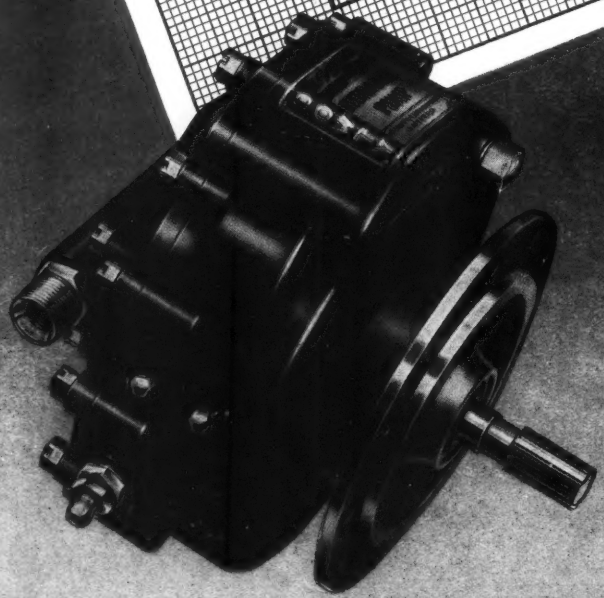

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FIRST AERONAUTICAL WEEKLY IN THE WORLD : FOUNDED 1909

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The Outlook

The New R.Ae.S. Spirit

THERE was a time when the Royal Aeronautical Society used to be referred to by the cynics as "The Mutual Admiration Society." There was some justification for the tag. Too frequently when a paper had been read by someone from the Royal Aircraft Establishment, the ensuing discussion mainly took the form of people from the Air Ministry getting up and praising the work done by the R.A.E., or vice versa. In that way a semblance of backing was established for the refusal of official technicians to see any usefulness in such new-fangled notions as variable-pitch airscrews and retractable undercarriages.

Things have changed. One does not nowadays find much admiration as between the Air Ministry and the Ministry of Aircraft Production, or between the M.A.P. and the Admiralty or War Office, or between them and the Air Ministry. In the case of the Royal Aeronautical Society, under such recent presidents as Mr. Arthur Gouge and Sir Roy Fedden, the somewhat academic atmosphere which used to characterise earlier lectures has during the last few years given way to a more practical approach to technical and other subjects. In short, there has been a great awakening, and the present council has given many indications of its determination to make "The Royal and Ancient" a really live force in British aviation.

This new spirit in Hamilton Place finds further expression in a series of three debates to be held on January 23rd, February 8th, and March 13th, the subject being civil aviation. It will be recollected that the one-day debate held last November, although many of the talks given were excellent in themselves, rather meandered all around and over the subject, which is indeed a very wide one. This year the intention is really to "get down to brass tacks." There will be a specific subject; a certain number of speakers will argue "for" and a similar number "against." The motion for the first of the three debates will be: "That in the opinion of this meeting it is desirable that persons experienced in transport services, e.g., shipping and railways, should take part in the development of civil aviation."

Not only is the subject a burning one, but it is one on which opinions differ strongly. There are many who hold that it would be unfair to have let the pioneers do all the difficult work during the early days of civil aviation, only to have the fruits of their labours taken away from them by other interests as soon as truly commercial flying begins to promise to be a possibility. The other side argues that, particularly in the case of shipping, a vast world organisation of agents, ports, customs, etc., already exist, and that to duplicate all this for air transport would be wasteful. Thus we may expect the debate on January 23rd to be both interesting and instructive. It is to be hoped that the virtual handing-over of Latin America to the United States will receive attention.

Debatable

SUBJECTS for the other two debates have not yet been chosen, we understand. There are plenty which need ventilating. For example, there is the thorny one of the single "chosen instrument." A really searching debate on this would be fruitful, but there might be some difficulty in getting speakers "for" the single company!

We almost hesitate to suggest as another subject the Chicago Conference; some fairly pointed remarks would probably be made. But the way this country was outmanœuvred at every turn, largely due to unpreparedness and the inelastic nature of our policy, calls for outspoken comment, even if it is by now a case of the dehydrated milk being scattered all over the doorstep.

A debate on the urgent necessity of formulating at once an Empire air policy might also be useful in causing the dawning in Whitehall of a realisation of the need for immediate action if we are not to rest content with a second-rate place in post-war air transport.

Bridges and Bulges

GENERAL ARNOLD, Commanding General of the United States Army Air Forces, recently said in Washington: "Lack of air power brought the German offensive to a grinding halt." While he was speaking, General Arnold described the three basic principles of T.A.F. operation in the following words:—

"We neutralise the enemy's air power by hitting his airfields or taking out his planes in aerial combat."

"We isolate a battle area of our own choice by cutting enemy supply and communication lines, such as bridges and railroads."

"The tactical air forces co-operate in the closest possible ways with advancing or defending ground troops."

While claiming that air power had saved the day, he failed to point out that it was a departure from these basic principles which had allowed the offensive to build up.

If the Rhine bridges had been blown in the same manner as were those over the Seine, neither Rundstedt, Model, nor any other German general would have dared to bring across the Rhine all the heavy equipment necessary for a major offensive.

If the four days of clear weather which followed Christmas had not arrived and a less able commander than Air Marshal Sir Arthur Coningham (who temporarily took over the American 9th and 29th Tactical Air Commands, in addition to the British 2nd T.A.F.) had been at the helm, then the plight of the port of Antwerp and the 21st Army Group might easily have become very serious.

Even now, after much damage has been done, it is only the railway bridges which are being attacked. Every important railway bridge between Karlsruhe and Cologne has now been bombed. Some are damaged and some destroyed. This will, of course, have the effect of throwing a great extra strain on road transport to keep up supplies, but it can never be hoped that the front can be really starved by these half-measures.

Until the vernal equinox at the end of March, the Germans are going to have over twelve hours of darkness in every 24, during which period supplies can be moved fairly freely. If they are allowed to proceed unhindered, this should give them plenty of time to accumulate sufficient material to make our spring operations very expensive.

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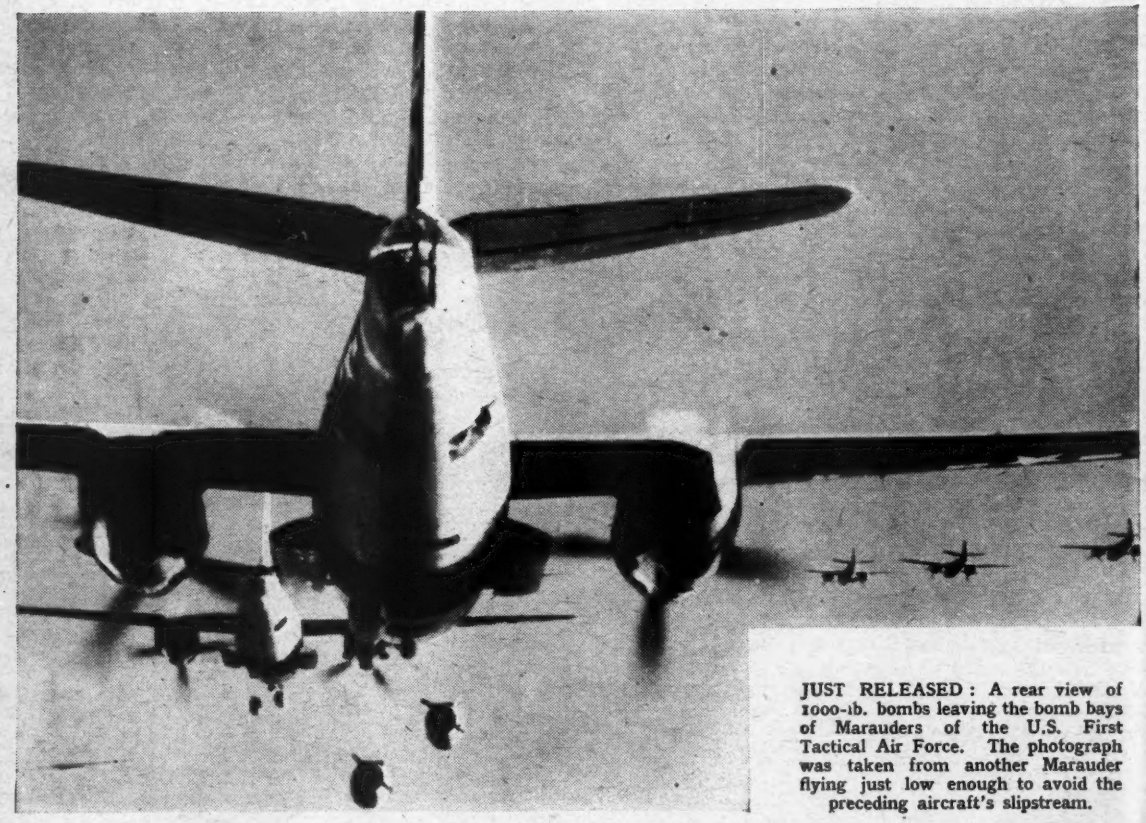


JUST RELEASED: A rear view of 1000-lb. bombs leaving the bomb bays of Marauders of the U.S. First Tactical Air Force. The photograph was taken from another Marauder flying just low enough to avoid the preceding aircraft's slipstream.

WAR in the AIR

Combined Ops. at Luzon : Mediterranean A.A.F. at Work Again : Snow Helps Rundstedt : B29s at Singapore

Holding down the tail of a Spitfire in Holland while the Merlin engine is run up. Cold work these days.

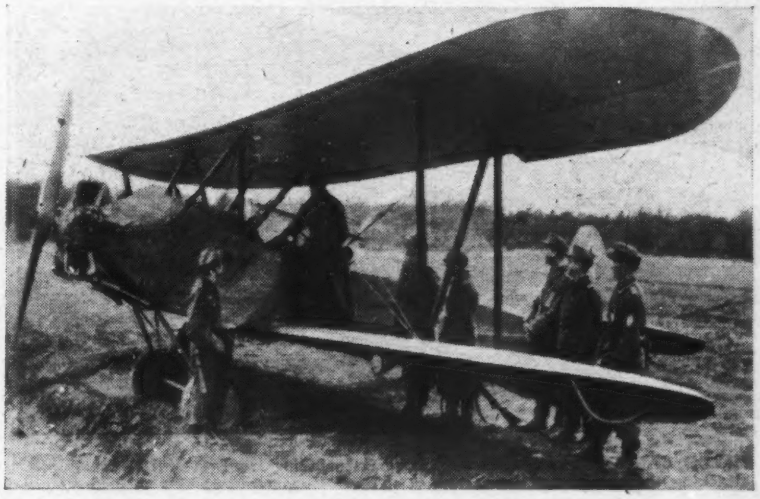
THE American landing on Luzon, the most northerly and important of the Philippine Islands, is first-class good news. For some time past U.S. aircraft have been sedulously plastering the airfields in the island, and it almost goes without saying that the landing was preceded by a bombardment from the air and from the guns of warships. The Japanese had for some days previously been announcing that American invasion fleets were approaching Luzon; but they seem to have been taken by surprise when the American troops landed where they did. Perhaps some feint landings may have deceived the enemy. At any rate, Gen. MacArthur took his men ashore at Lingayen, about half-way up the western coast, and promptly seized the airfield near the town. Japanese aircraft attacked the American vessels and sank some of the smaller craft, but did nothing of importance. No transport was damaged.

On land the Japanese resistance was not formidable, and American aircraft lost no time in cutting roads and railways which might help the enemy to move up forces to oppose the liberating Army. Construction battalions with their bulldozers and other helps were among the first to follow up the advanced guard of infantry and armour, so that any airfields captured might be got into working order with the least possible delay. It is chiefly the work of the American bombers which needs to be made good.

Gen. MacArthur, who must be delighted to be back in the island which he defended so heroically in 1942, has said that the central plain was the spot where the battle for Manila and the entire Philippines would be fought and won. That rather sounds as if he puts his main trust in his armour.

For a considerable time past American bombers have been regularly attacking targets in Formosa. Tokyo has not seen the last of American Superfortresses. In time her citizens will see also British and American ships, sailors and soldiers.

In Italy the weather improved last week, especially on the front of the 5th Army. The snow hampered movements on the ground, but the M.A.A.F. immediately got busy, and on the first of the clearer days flew nearly 1,000 sorties. The 1st Tactical Air Force hit more than 225 waggons on the railways of the Po valley, medium bombers did some damage to



RUSSIAN GRASSHOPPER: A U.2 shot down by rifle fire behind the German lines. The Russians use these light biplanes for artillery spotting, ambulance work and for close contact over the battlefield at night.

WAR IN THE AIR

bridges, and fighter-bombers exploded two large ammunition dumps near Parma. The lines on both sides of the Brenner Pass have been bombed frequently of late. It is cheering to hear of our aircraft getting busy once more in Italy; but we can hardly expect sensational advances on the ground in the winter.

In the Ardennes

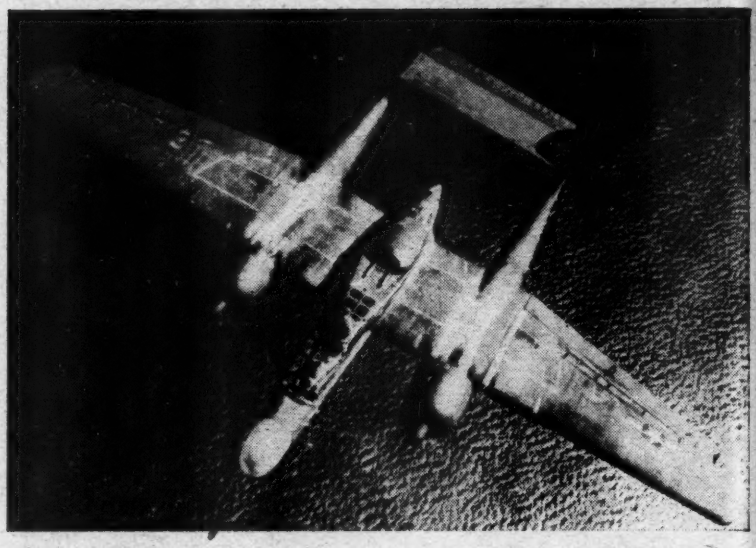
TOWARDS the end of last week it became certain that Rundstedt had decided to cut his losses and withdraw from the salient he had created in the Ardennes. This time Hitler does not seem to have interfered and ordered the German troops to die where they stood. It is probable that, however he may like to override his military advisers, he is in no position to give such orders to Rundstedt. He once dismissed him from the command in the West, but he had to bring him back. That puts the Marshal in a very strong position *vis-à-vis* the Führer, however much the latter may dislike the former as an anti-Nazi.

Field Marshal Montgomery, in his recent Press interview, asked what Rundstedt was trying to achieve by his attack, and replied that no one could tell for certain. His gains would not win the war, and he was likely, slowly but surely, to lose them all. Since then the pressure by Montgomery's Army Group on the north and that of General Bradley on the south have been gnawing down the side walls of the German salient. At the moment of writing, the attempt to cut it in half by pressure from Bastogne on the one side and Grandmenil on the other has not succeeded, and the Germans were left with one good road by which they could escape. Then came what was for the Allies a tragedy—the snow. Had the skies been clear, their aircraft could have hammered that road and converted what seems to be an orderly withdrawal into a holocaust like that round Falaise.

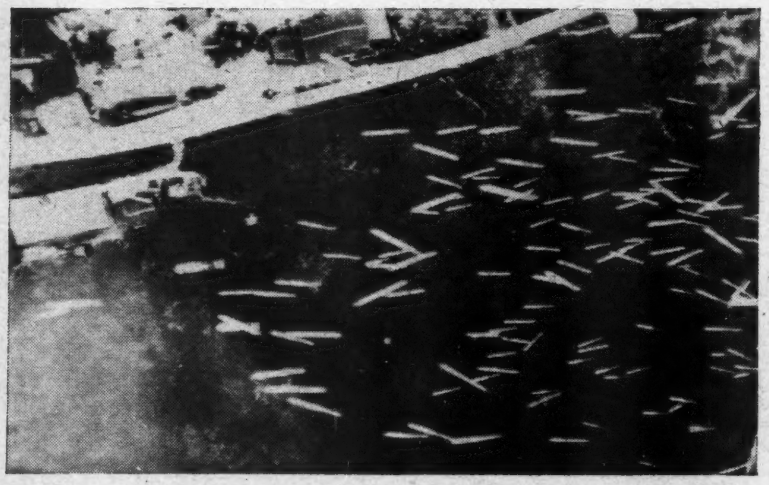
The Germans are very clever at withdrawing their forces if Hitler allows them to start in good time; and at the moment it looks as if the whole incident will be for the enemy a failure but not a disaster.

The German soldiers will, however, scarcely fail to remember the words of Rundstedt's proclamation at the start of the adventure. He said then that it was the last great effort to try to win the war and that everything depended on it. To any intelligent German it must follow that the retreat means that no chance of winning the war is left. The soldiers are doubtless very thankful that they are able to pull out without being cut to pieces by Allied aircraft; but they can hardly retreat in very good heart.

The German soldier, plodding wearily back from Laroche towards the Rhine probably knows little about what is happening on the Eastern front, and is too full of his own troubles to care much. The High Command, however, must be full of dismay at the failure (so far) to relieve the German Army in Budapest. If the enemy loses all the troops in the Hungarian capital it will be a serious blow to him, for man-power is now one of his main problems. For the city of Budapest the Germans have said openly that they do not care. Its loss can be borne with equanimity. What they do dread is the loss of Vienna, and it seems that that must follow the loss of Budapest. The Allies would look on the occupation of Vienna as a liberation rather than as a conquest; for, though Austrian troops have fought against us in this war, the last independent Government of Austria was strongly opposed to Hitler and all his works. The way in which Mussolini first supported Austria against Germany and then deserted her is one of the blackest incidents in the grimy career of the Fascist Dictator.



WIDOW'S MIGHT: An almost plan view of the Northrop P-61 Black Widow night fighter. The cannon with which it is equipped are not visible, but the top turret with two .5in. machine guns can be seen pointing forward.



MIXED CARGO: Incendiaries and H.E. bombs falling from an R.A.F. Liberator attacking the newly built Japanese port of Khao Huagang on the Malay Peninsula.

Bombing Singapore

THE U.S. 20th Bomber Command, under Maj. Gen. Curtis Lemay, which is stationed in India, has been very active of late. Within ten days recently its Superfortresses carried out four major missions. The first three were directed against Bangkok, Formosa (which has since been bombed by carrier aircraft from the U.S. 3rd Fleet) and Kyushu. The fourth was against targets in Singapore and Penang. The harbours and surround-

WAR IN THE AIR

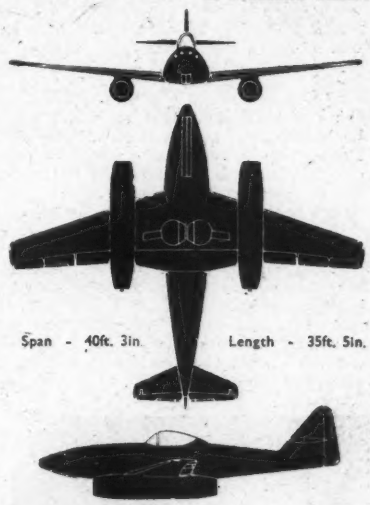
ing buildings were the chief targets. The opposition of Japanese fighters was not formidable and the A.A. fire was described as meagre and inaccurate. None of the American bombers was lost, and they all came home after a round trip of over 3,500 miles.

The number of Superfortresses in the Pacific area is evidently swelling, and, though no Japanese town can yet be treated as Hamburg and Cologne have been, the danger is growing, and its growth must be highly disturbing to the Japanese war lords. It can scarcely be exactly welcome to the civil population and the factory workers.

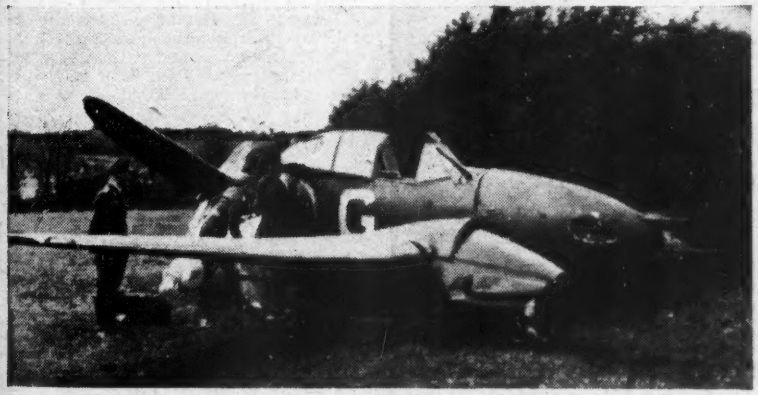
Some fine weather marked last week-end, and on Saturday the Allied Tactical Air Forces had about four hours' flying. They put in 650 sorties. Sunday was better, and the aircraft struck in strength at enemy columns moving eastward out of the threatened head of the Ardennes salient. Many transport vehicles were destroyed, and some armour. But the chance came too late to prevent the Germans from evacuating the bulk of their armour from the salient. This episode is now pretty well over, and it remains to be seen what the next move will be, and which side will make it. It is known that the Germans in their advance overran a number of supply dumps, and the loss of the material in them will have to be made good before Gen. Eisenhower will be in a position to commence another full-scale offensive. It is fortunate that the port of Antwerp is open.

Of course, the heavy bombers also went out, attacking oil supplies for the main part, while Halifaxes made an afternoon raid on the railway yards at Saarbrücken. These yards were crammed with trucks full of supplies for the German front, which could not get away because of the great dislocation of the German railway system west of the Rhine. The dislocation is one of the dividends of methodical bombing; and the destruction of the goods waggons follows on as a logical result. It is some compensation for the loss of supply dumps during the German advance.

FROSTED GLASS: Cleaning snow from the navigator/bomb-aimer's compartment of a Second T.A.F. Mitchell in Belgium.



Latest silhouette of the Messerschmitt Me 262; two Jumo 004 axial flow, gas-turbine jet units.



UPS AND DOWNS: A Westland Whirlwind shot down behind the German lines on the Western Front. Originally designed as an interceptor fighter, the Whirlwind has had to spend most of its operational life as a low-level strafer.

Before the bombers of the U.S. 8th Air Force took off, an order of the day by Gen. Spaatz was read out to the crews. In it the General said: "Your mission is to attack vital units of the German oil industry. It is comparable in importance to your operations against the German aircraft industry from February 20th to 25th, 1944, when you assured air supremacy for the Allied landing in France. . . . The output of military products has been reduced to the point where German reserves are now critical. . . ."

The Russians Strike Again

THOUGH bad weather kept aircraft grounded, the Russians opened their long-expected winter offensive on the Polish front, and their formidable artillery tore lanes in the German defences through which their ground forces poured. Berlin radio said: "We must have no doubts about the powerful masses of troops, tanks and aircraft which have been assembled by the Russians in order to hammer at the German front. The Russians are not only out for gains of ground but for the final decision. . . ."

In Luzon the Americans are described as having "complete air supremacy," and Superfortresses have been raiding Japan and Formosa.

Admiral Sir Bruce Fraser has said that the British Fleet expects to play a major rôle with the American Fleet in actions in the near future. "The Allies," he said, "have overwhelming sea-power as well as superior air strength. . . . It is a truism that he who has control of the sea and is increasing in sea-power, as we are, must win."

HERE AND THERE

AIR COMDRE. W. S. CHURCHILL : The Prime Minister, who is Hon. Air Comdre. of No. 615 Sqn. (County of Surrey), A.A.F., with Field Marshal Sir Bernard Montgomery and Field Marshal Sir Alan Brooke, during his recent visit to the Belgian front.

Out and In

THE first call-up notices were sent last month to some of the 4,200 R.C.A.F. trainees previously released from the Air Force. The men were given the choice of voluntarily transferring to the Army or awaiting their call.

A.T.C. Gliding Progress

MORE than 250,000 glider launches have now been made at A.T.C. gliding schools, of which there are now more than 80 in Great Britain and Northern Ireland. The total number of such schools is expected to reach the century during the next 12 months.

Built and Bought Them

EMPLOYEES of the parent factory and immediate dispersals of the Bristol Aeroplane Co. have just passed the £1,000,000 mark in their War Savings drive—in other words, they may pride themselves that they have paid out of their pockets for an appreciable number of the Beaufighters, Hercules engines, and other products, which they have been building.

New Folland Designer

FOLLAND AIRCRAFT, Ltd., announce that Mr. Stanley H. Evans has been appointed chief designer. Mr. Evans has had wide experience both in this country and in America, which will be backed up by that of Mr. H. E. Preston, chief engineer and technical director, and Mr. H. P. Folland, managing director and consultant to the design department.

To Lay Golden Egglets!

CIVIL versions of the Grumman J4F-2 Gosling amphibian are now being built, by permission of the War Production Board and the U.S. Navy, for Latin-American business firms whose representatives want their own air transport. The present order is for 25 of them.

The Gosling began life before the war as a very attractive four/five-seater amphibian suitable for the wealthier type of private owner or the air-taxi operator. It is powered by two 200 h.p. inverted air-cooled in-line six-cylinder Ranger engines, cruises at 150 m.p.h., and was called the Widgeon. Its pre-war price was $25,000.

To Look After Colonials

THE first coloured West Indian to be awarded the D.S.O., Flt. Lt. P. L. U. Cross, D.S.O., D.F.C., of Trinidad, has been attached to the Colonial Office for duties in connection with the welfare of Colonials in the R.A.F., and will visit R.A.F. stations at which there are Colonial airmen.

The great majority of the several thousands of Colonials serving with the R.A.F. are from the West Indies.

In Washington

AIR MARSHAL DOUGLAS COLYER went to Washington recently to take up his appointment as head of the R.A.F. Delegation and as R.A.F. member of the British Joint Staff Mission in succession to Air Marshal Sir William Welsh.

Retired from R.A.F.

AIR MARSHAL SIR WILLIAM L. WELSH has retired at his own request.

Sir William, who in 1943 was appointed head of the R.A.F. delegation to Washington, recently went to Sweden in his capacity of European Regional Director of the B.O.A.C. to inspect air facilities.

It was also announced that Air Vice-Marshal Sir John Baldwin, former Commander of the Third Tactical Air Force on the Burma Front, reverts to the retired list with the rank of Air Marshal.

Group Capt. F. C. Halahan resumes the rank of Air Vice-Marshal on revert-

PASSENGER COMFORT : Priority passengers carried between Britain and Sweden by B.O.A.C. Mosquitoes travel in the bomb-bay, which is padded to provide some degree of comfort. He can talk to the pilot *via* the inter-com. and (for his peace of mind !) is strapped in.

HERE AND THERE

ing to the retired list. He was formerly director of technical development to the Air Ministry.

Their War's Over

ALL officers and airmen below the rank of acting squadron leader and on the general list of flying personnel are to be given their discharge from the R.C.A.F. upon reaching their 33rd birthday, says a report from Canada. Temporary squadron leaders will get their discharge on reaching their 36th birthday.

Chief "Tiger" Decorated

MAJOR-GEN. CLAIRE CHENNAULT, Commanding General of the 14th U.S. Air Force, has been awarded the Legion of Merit.

Gen. Robert McClure, Chief of Staff, China, who made the presentation, said: "I know of no one in the army that I would rather pin this medal on than you."

The citation said that Gen. Chennault had been decorated for "exceptionally meritorious conduct in the performance of outstanding services as Commanding General of the China Air Task Force from July 4th, 1942, to March 9th, 1943, when, with an exceedingly small force of personnel and aircraft, he directed American assistance to the Chinese Allies."

His task force became known as "The Flying Tigers" and used P-40 fighters.

Flak Curtains

A CONVERSION programme to increase protection to U.S. airmen and cut down the weight of American heavy aircraft has been announced by U.S. Air Service Command.

Tons of heavy armour plating is being taken out of Flying Fortresses, Liberators, Marauders and Havocs, and lightweight "flak curtains"—overlapping squares of manganese steel, resilient enough to stop a 20 mm. shell exploding two feet away—substituted.

Designed by Brig. Gen. Malcolm C. Grow, Chief Surgeon of the U.S. Strategic Air Forces in Europe, and inventor of the flak suit, the flak curtains are being installed in sheets and strips around crew members.

This, experts say, provides better individual protection for crewmen, and lightens bombers so that they can carry heavier bomb loads. Gliders, too, are being fitted with flak curtain flooring.

Old-style armour plating is, however, being retained on the big bombers in the tail and around the engines.

"Ach! Der rockets haf spent—Gott Sei dank!"

Industrious Dakotas

TRANSPORT COMMAND has now delivered more than 28,000,000 lb. of battle equipment to the Allied Forces in France, Holland and Belgium, and on return journeys to Britain the Command's Dakota aircraft have brought back more than 50,000 wounded without a single mishap.

Speedy supplying of urgently needed war materials to the Allied Armies and Air Forces on the Continent is Transport Command's primary task. But they have also dropped more than 5,000 paratroops behind the enemy's lines, and landed about 14,000 soldiers and airmen on forward airfields.

One More Card?

"WE must always strive for better and more efficient methods of defence, for the Hun is as crafty as a fox, and may even yet, in his death agony, throw in one more card," said A.V.-M. J. B. Cole-Hamilton, A.O.C. a Fighter Command group, when recently presenting an A.A. co-operation squadron with its crest at an airfield in the South of England.

The squadron's motto of "Precision in Defence" had, he stated, been well chosen and had been achieved.

The crest was received by the C.O., Wing Cdr. E. D. Crundall, A.F.C., who has led the squadron since its formation.

R.A.F.'s Helping Hand

MOST men who join the R.A.F. doubtless expect to be engaged either directly or indirectly in helping to destroy enemy property, but some 2,000 of them have been busy during the past months performing an equally important, if very different sort of job—that of repairing British property damaged by the enemy.

NICE WORK: Two beautiful examples of model aircraft at the Dorland Hall exhibition last week; a rocket-firing Typhoon and a Firefly with folding wings, insured for £300.

More than 15,000 blitzed houses in Southern England have now been made habitable by a Repair Unit (Buildings) of R.A.F. Technical Training Command, which has put in 2,186,000 man-hours on this special task.

The airmen, working under skilled N.C.O. foremen of trades, are all volunteers for the work, and the unit's C.O. has received many appreciative letters from bombed-out residents stressing their efficiency and courtesy.

It "Larns 'Em"

NOVEL "decorations" designed to decrease errors of aircrew have been instigated by the C.O. of a Beaufort squadron in northern New Guinea. There are two types of medal given "for services rendered to Japan"—the Tokio Star and the Order of the Irremovable Digit.

They are won for lapses on missions, such as dropping bombs in the sea, crashes through carelessness, leaving switches turned on in aircraft, etc. A citation is composed, and the "medal"—a huge piece of tin 6in. in diameter suspended from a ribbon 6in. wide, awarded.

The recipients are expected to wear the award at any time they are in the crew room, and they retain it until someone else makes another "boob." A record book is kept by the squadron showing the date, name, photograph, citation and signature of the recipient.

The wording on the T.S. (Tokio Star) states: "Honourable glatitude pleez to accept. Hirohito."

There has been a noticeable absence of carelessness since the awards were created, it is reported.

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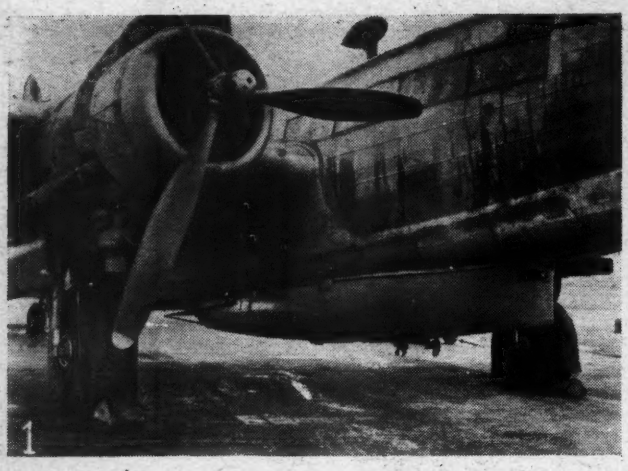


Airborne Lifeboats

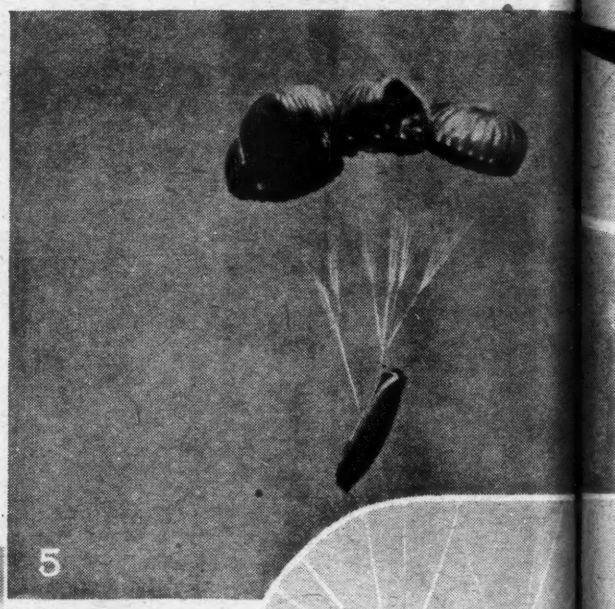
Fully Provisioned Power Lifeboat Dropped to Ditched Air Crews

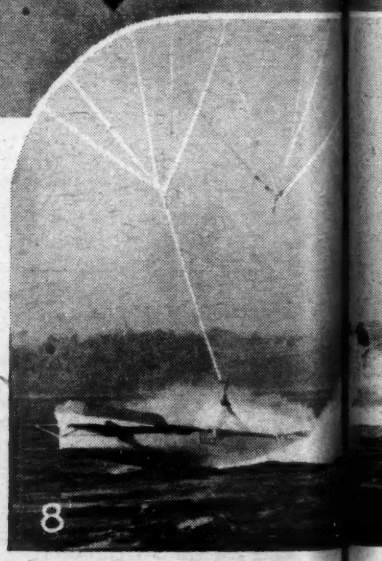
TO someone, and it is said to be Air Chief Marshal Sir Arthur Harris, of Bomber Command, must go the credit for having first conceived the idea of dropping from an aircraft, by parachute, a genuinely seaworthy, well-provisioned and fully equipped lifeboat so that ditched air crews, having taken to their ordinary rubber dinghies, could be given a very real chance of getting back to these shores even though from very long distances and in poor conditions.

In a war where the most highly developed scientific and mechanical devices for killing are in everyday use, it is both comforting and morally edifying to realise that great ingenuity has been evoked in devising the solution to a humanitarian problem. It is, perhaps, fitting that aircraft should play a leading part in it.

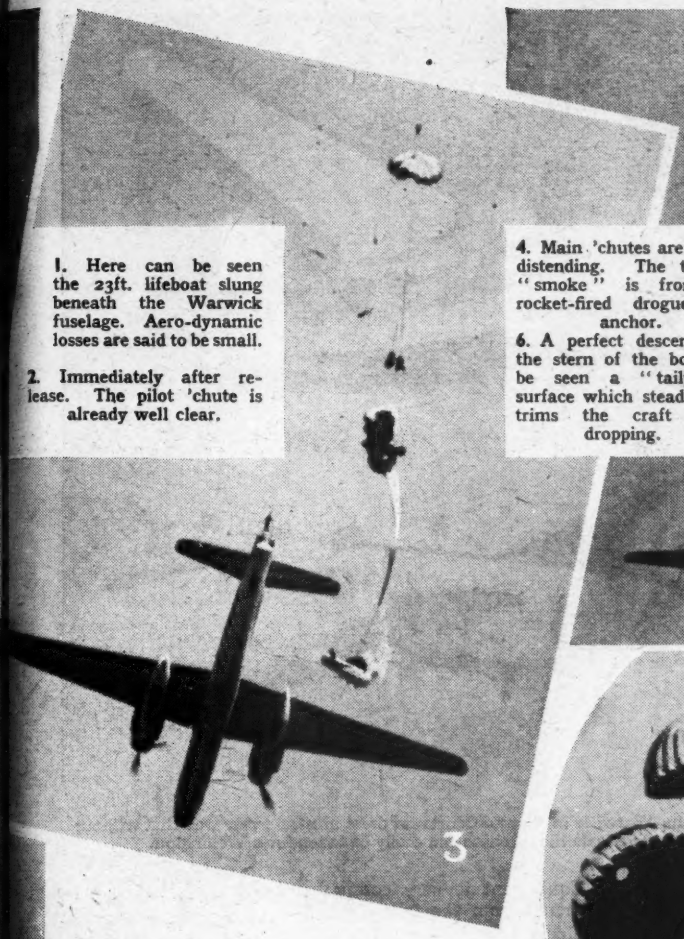
About the middle of 1941, when it had been decided that an airborne lifeboat was not an idle dream, Group Capt. (now Air Comdre.) E. F. Waring, who was responsible for the development of the idea, approached A. C. Robb the yacht designer, who is now a Lieutenant Commander, R.N.V.R., and asked him to design a suitable boat for the purpose envisaged.

At that time the Hudson was selected as the carrier aircraft, and it was thought that for aerodynamic reasons the lifeboat must be accommodated within the bomb bay.





7. A moment before actually touching down. The sea anchor will prevent the boat drifting. 8. On striking, as the shroud cables slacken they are automatically released.



1. Here can be seen the 23ft. lifeboat slung beneath the Warwick fuselage. Aero-dynamic losses are said to be small.

2. Immediately after release. The pilot 'chute is already well clear.

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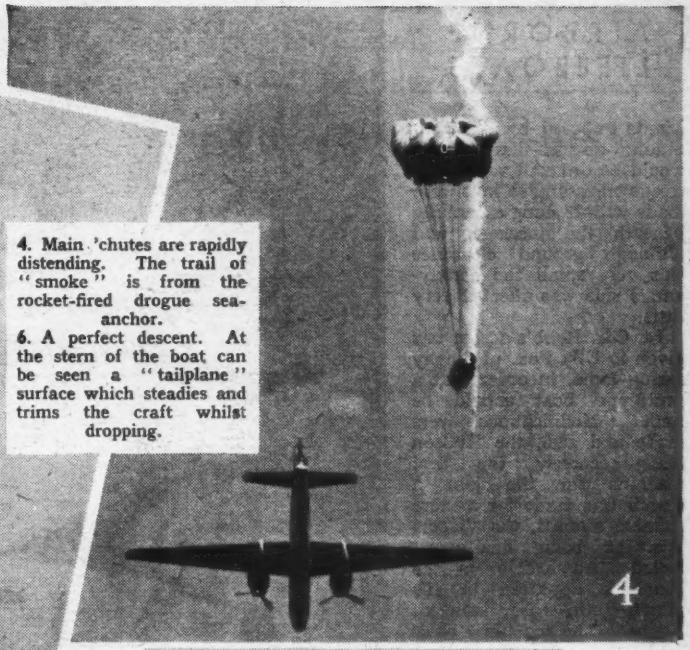

4. Main 'chutes are rapidly distending. The trail of "smoke" is from the rocket-fired drogue sea-anchor.

6. A perfect descent. At the stern of the boat can be seen a "tailplane" surface which steadies and trims the craft whilst dropping.

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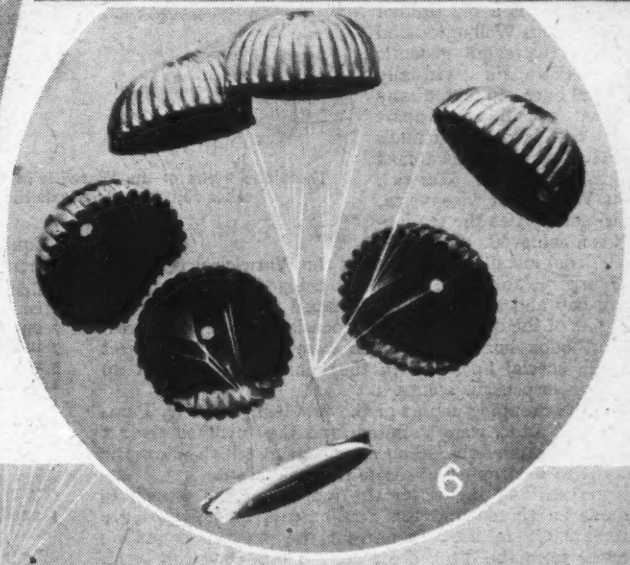

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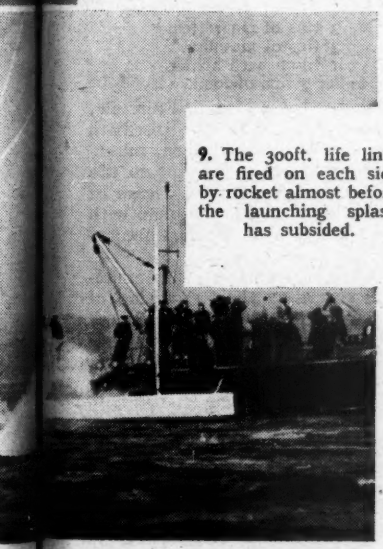
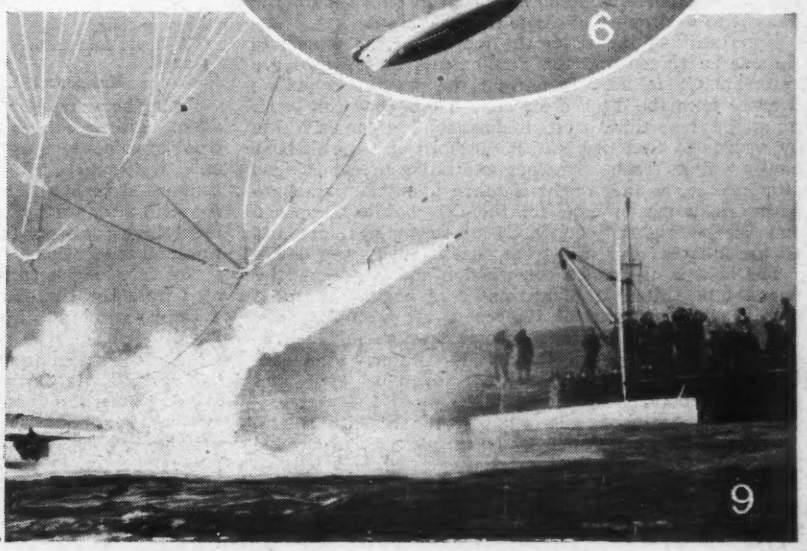
3. Pulling out the six main "brollies." Notice how quickly this happens as illustrated by the position of boat and aircraft.

5. Going down with all six parachutes almost fully opened.



9. The 300ft. life lines are fired on each side by rocket almost before the launching splash has subsided.



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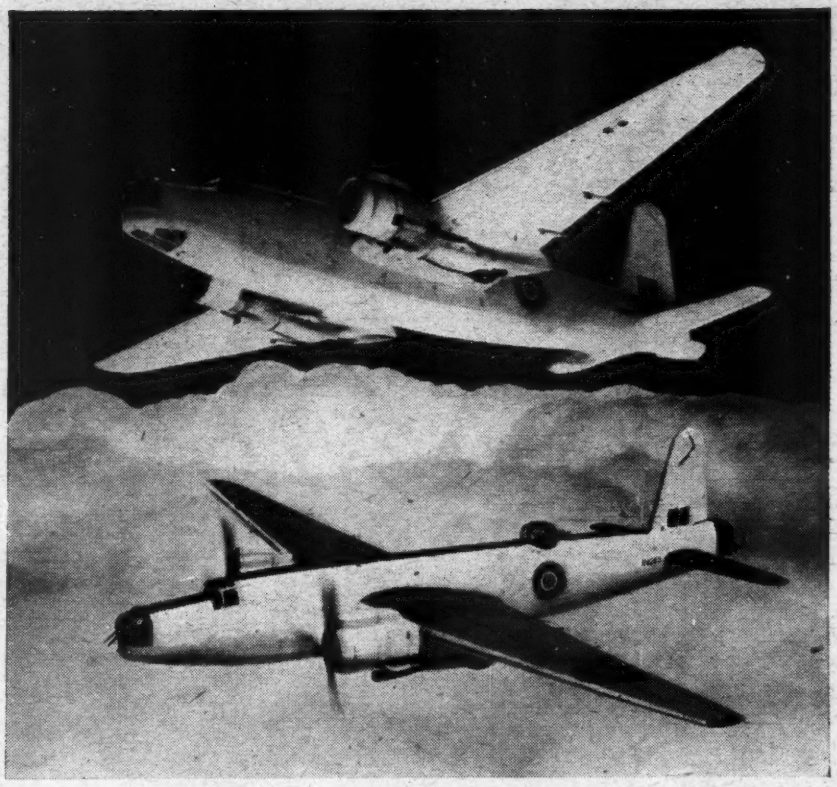
AIRBORNE LIFEBOATS

Limits imposed by this condition were such that the boat would be of small value as a rescue craft, and so tests were made with it slung externally beneath the fuselage, and although ground clearance was very small the aerodynamic side was affected very little.

Lt. Cdr. Robb's design was given to Uffa Fox, of dinghy racing fame, in order that a prototype boat should be built. Modifications were made and also, the Hudson being scarcely the best machine for the job, a search was made for a more suitable aircraft, the Vickers Warwick being finally selected. An article on the Warwick appeared in the March 30th, 1944, issue of *Flight*. The machine, as is well known, is a big brother of the famous Wellington and employs the same geodetic construction on virtually identical lines—in fact, at any distance at all, and apart from the larger machine's dorsal gun turret, it is almost impossible to tell Warwick from Wimpy, or vice versa, so accurately has the scaling-up been achieved.



These two views of the Warwick in Coastal Command dress illustrate very well that without other objects to give scale the machine can easily be taken for a Wellington.

The trial installation design for the Warwick was started in February, 1943, the 23ft. boat being slung beneath the bomb bay and its gunwales so shaped as to fit snugly the contours of the bomb doors. Suspension was designed with the orthodox bomb slips which were arranged to project through special apertures in the bomb doors to pick up the boat suspension points.

For the dropping aspect of the problem, the G.Q. Parachute Co., Ltd., were co-opted, and they evolved the six main 'chutes and shrouding arrangement which allow the lifeboat to be dropped at a safe rate of descent.

Upon striking the water the tension of the parachute shrouds is relaxed and the attachments to the boat are automatically released to prevent the parachutes pulling it away from the ditched air crew before they can reach it; at the same time, 300ft. lifelines are fired on each side by rockets so that they can be grabbed and the lifeboat hauled within reach. Another interesting aspect is that, after release, as the weight is taken upon the parachute harnesses, a master cock for the CO_2 bottles is opened and the self-righting buoyancy-tube coamings fore and aft are inflated; this whilst the boat is on its way down.

The boat is of wooden construction and is powered by two 5 h.p. Britannia Middy outboard engines mounted inboard about a third of the length aft from the bow. In this position the screws become tractors in that the craft is virtually pulled through the water. Fuel consumption is at the rate of about 1 gallon per hour, and the speed is between 6 and 7 knots.

Although equipped with engines, the lifeboat is also provided with a mast upon which can be set a jib-headed loose-footed sail. No keel or centre board is fitted, so that leeway is probably considerable; however, as a means to eke out the fuel supply or steady the craft in bad weather the sail is, no doubt, an invaluable addition.

Equipment is very comprehensive indeed, as may be gathered from the following list:—

1 first-aid kit.	3 buoyant rocket heads.
1 compass.	3 firing cartridges for rockets.
7 outer suits and satchels.	1 Very pistol.
7 inner suits and satchels.	18 tins of 3 Very cartridges.
3 smoke floats.	1 Aldis lamp.
1 chart board and case.	1 cover sheet.
1 ship's log and case.	1 bottle of Dinament.
1 bilge pump and hose.	14 Everhot heaters.
1 pair of hand bellows.	24 tins of drinking water.
4 rowlocks.	3 tins of cigarettes.
1 sea anchor.	3 tins of matches.
1 W/T set and case.	1 torch with holder.
3 cups.	

Rations: 28 tins of milk; 7 tins of food.

From the above it will be seen that a stranded aircrew, afloat in their rubber dinghies possibly off the Biscayan coast or somewhere in the wastes of the North Sea, miserable, wet, suffering from cramp and exposure due to the confines of their little craft, are given a renewed lease of life with a seaworthy, self-righting lifeboat, complete with everything necessary for sustenance, warmth, communication and navigation.

Not very long ago a fairly large splash of publicity emanated from the United States regarding their provision of a similar airborne lifeboat carried by a Fortress. In all fairness it should be pointed out that the idea was presented by Britain to the American authorities. In fact, one of our boats was sent out to them and, with the now familiar American appreciation of a good thing, the equally familiar result of American inventiveness was the inevitable result. Why is it, we wonder, that the newspapers of a people who have such great qualities, and who are responsible for giving so many valuable things to the world, seem so frequently to be unwilling to give honour where honour is due?

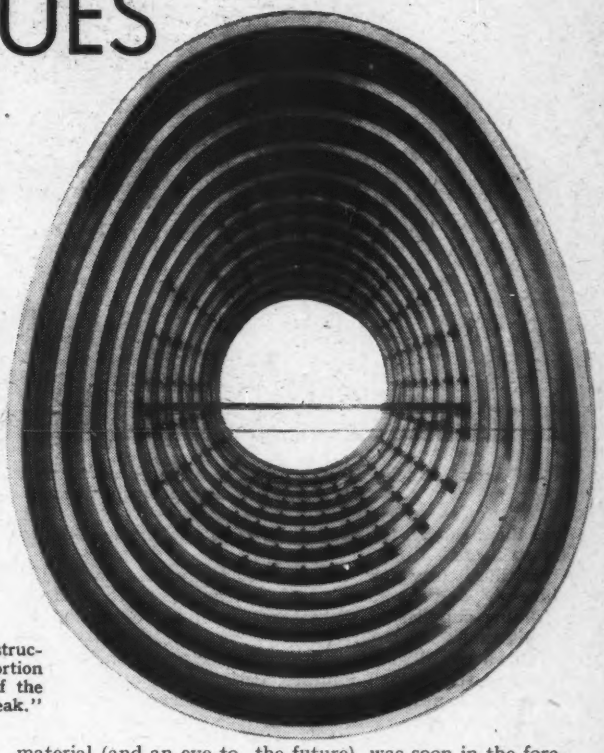
MONOCOQUES

A Brief Survey of the Development and Some of the Problems Involved in the Design of Stressed-skin Fuselages

By MAURICE F. ALLWARD

THE monocoque fuselage has been devised to do the greatest possible amount of work with the smallest number of component parts. It is a fascinating proposition to design a structure in which each member is doing more than one job.

There seems to be a general impression, even in the aircraft industry, that stressed-skin construction of aircraft originated in the United States, while others believe Junkers were first in the field. The former are completely wrong, and the latter only partly correct; for, while Professor Junkers was undoubtedly the first to produce an all-metal aircraft, the fundamental principles of his construction do not appear in modern monocoques. The Junkers effort was based on metal-clad rather than stressed-skin construction, and the covering took little part in bearing the loads.



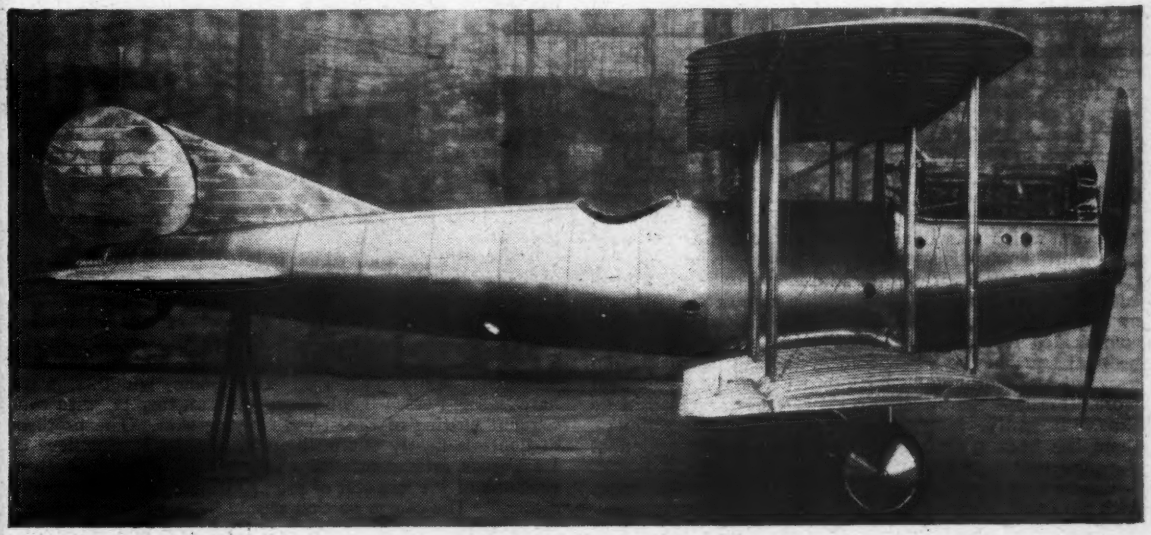
Stressed-skin construction in 1920. A portion of the fuselage of the Short "Silver Streak."

[While it is true that Hugo Junkers was the first to produce a full-size all-metal aircraft, his ideas were anticipated in England by Mr. William Cochrane, who argued strongly in favour of the corrugated-sheet construction later adopted by Junkers, and made aircraft models and airscrews long before the German machine appeared.—ED.]

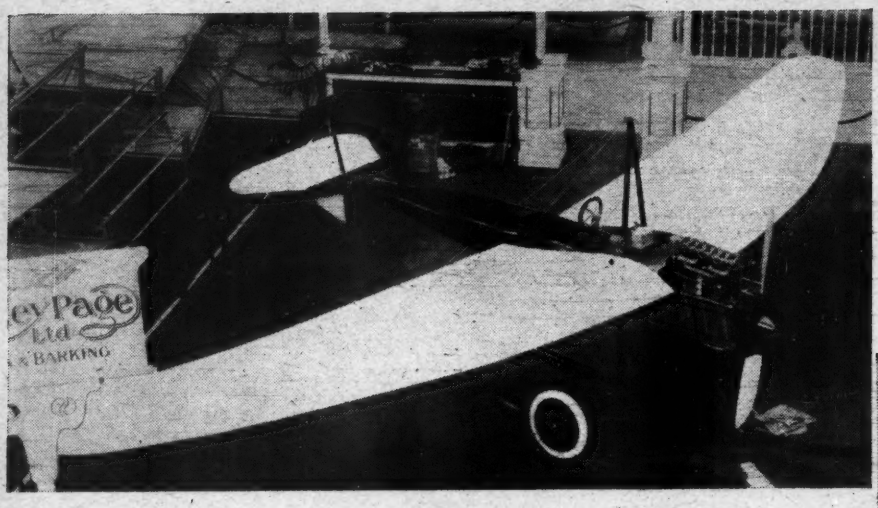
The British are often denounced for being slow to try the unorthodox, and while this may be true generally, it does not apply in the case of stressed skins, for which credit can rightly be claimed by us for having been in this particular field very early. It was not the fault of the originators that the scheme was not immediately approved and universally adopted.

Very early monocoques were constructed from plywood, and Germany, with ample supplies of good-grade raw material (and an eye to the future), was soon in the forefront of plywood-covered aircraft, in particular the stressed-skin monocoque. Their accumulated experience resulted in the Albatross DV and, later, in the Heinkel He 70.

[Actually credit for the first wooden monocoque fuselage should go to Sir Frederick Handley Page, who, at the Olympia Aero Show of 1911, exhibited a pretty little monoplane with crescent-shaped wings and a highly polished mahogany shell fuselage. Somewhat later came the British Deperdussin Company's monoplanes, the "Thunderbug" landplane and the "Seagull" twin-float seaplane, which also had a true monocoque in that the wooden shell



The "Silver Streak" was much ahead of its time and combined a stressed-skin fuselage with metal-clad wings.



The second Handley Page monoplane, exhibited at Olympia in 1911, had a highly-finished wooden monocoque fuselage.

was thick enough to take the loads without being stiffened by stringers.—ED.]

In those early days Britain relied upon Russia for her three-ply, and the latter's early collapse, coupled with the declining supplies of first-class spruce, led to much improvisation.

One early British attempt to produce a monocoque fuselage was the Parnall Panther, designed for carrier work, which incorporated an ingenious "breakdown" fuselage for storage purposes. The Sopwith Aviation Company fitted a Snail with an experimental planked monocoque fuselage early in 1918. The name, incidentally, was not a reflection upon its performance figures, but was an indication that the aircraft was essentially a "shell."

Inception and Return

However, it was the Short Brothers' Swallow, later renamed the Silver Streak, which introduced the metal form of this revolutionary construction in the design of aircraft. This was shown at Olympia in July, 1920, and there, although a number of engineers thought it the star exhibit, it did not cause the sensation one might have expected. The Silver Streak has been described in detail many times, but a few words on it should not be out of place here. The stringers were of V-top-hat section, and the formers of L-section, the free edge of which was bent over for stability. A point of interest is that where stringers and formers intersected, it was the stringers which were cut in preference to notching the formers. This rather unusual feature has appeared on all Short aircraft right down to the Sunderland and Stirling of to-day. The sections used for the stringers and formers seem very obvious now, but in 1920 there was little theoretical knowledge of this form of construction, and even less practical experience. The stabilising of free edges by rolling them over, however, which was done on the formers, was certainly an important step forward in monocoque design.

On later fuselages it was found difficult to design a fuselage that was strong enough without a considerable amount of internal structure. An extreme example of this is the complicated fuselage of the Junkers 88. And so, after a brilliant start in the Silver Streak, the skin gradually did less and less work, and the internal structure more and more. Perhaps the Silver Streak was too far ahead of its time. Recently, however, especially on civil airliners, there has been a noticeable return to the conception of the pure monocoque.

The finished fuselage should be of good streamline shape, with smooth lines from front to rear and with no unnecessary bumps or hollows liable to upset the airflow. Two examples of what can be achieved by careful design is the finely streamlined fuselage of the Lockheed Constellation and the remarkably clean fuselage of the Boeing Superfortress. On the latter type an immense amount of painstaking work has obviously been done to reduce the large number of familiar bumps and knobs usually found on heavy bombers, particularly regarding the installation of the gun turrets.

The cross-sectional area should be as small as possible, especially where high speeds are required. One of the reasons why the Mustang has proved such a formidable fighter is because its frontal area is much less than that of other American fighters, and this has resulted in a very high top speed.

The front end will mount the engine, except in multi-engined aircraft where it is just a fairing. As an engine mounting it will have to be extremely rigid to take the large and complex loads of the engine with the aircraft in all altitudes. This function alone represents a major problem.

The centre portion, which is integral with the front end on most modern aircraft, will carry the cargo and the loads imposed upon it by the engine, wings and tail unit. This portion will also accommodate most of the equipment carried, and to facilitate accessibility this usually entails the provision of numerous access doors. This portion will also be liberally perforated with doors, windows, astro hatches, and often bomb doors and gun turrets, with consequent cutting of the stress-carrying skin. The problem of doors is neatly summed up by Mr. F. R. Shanley, of Lockheeds, who says: "Cut-outs in shell structures represent one of the meanest of problems facing the airplane designer." The centre portion should be particularly robust, for a strong centre section is a most desirable feature, as it will provide the designer with a firm "foundation stone"

MONOCO
CONTIN

A Sopwith "Snail" was fitte

upon which to build. The fuselage of the Bristol Beaufighter is built up on two substantial keel members, which result in a centre section of very great strength. The underside will be prone to damage in "wheels-up" belly landings, and it might be wise to reinforce certain stringers to act as skids should such an accident happen. The rocket-propelled, tailless Messerschmitt 163b fighter is reported to jettison its undercarriage after taking off, and to land upon a skid member built into the underside of the fuselage. This scheme, in a modified form, might be applied to very large landplanes in the not so distant future.

The rear end of the fuselage has to carry the tail loads. These will be vertical from the tailplane, horizontal and torsional from the fin and rudder, and vertical and often torsional from the tail wheel while taxying. On many modern aircraft it is the practice to "bury" the flying controls in this part of the fuselage, allowances for the operating cranks being made early in the design stage. A good example of this practice is given by the Hawker Typhoon, which has an exceptionally clean tail end, especially now the rudder mass balance is housed inside the fin shroud. The housing of the identification lights in the rear of the tailplane fairing is also a particularly ingenious feature.

fitted with a wooden monocoque fuselage

The duties for which the type is intended should be considered. A high-speed fighter, which will become obsolete after a few hundred flying hours, is in a different class from a commercial air liner that may still be operating after several years, as in the Douglas Dakota. In the case of the fighter, weight and performance are both more important than cost.

In the past the view was often held that in the case of civil transports it might be worth while sacrificing some of the pay-load to increase robustness. This was confirmed by Chief Engineer Guilonard, of the K.L.M. Air Lines, who claimed that their Fokker equipment was still satisfactory after many years' service. More recent experience, however, has shown that, providing the safety of the aircraft is not endangered, the maximum payload possible is desirable. To substantiate this an American has produced figures showing how every extra ounce of payload is ultimately worth literally just over twice its weight in gold.

The problem of serviceability—the criterion by which aircraft are largely judged in the R.A.F.—should receive special attention. It is not much good to have some of the finest aircraft in the world if most of the time they are "U/S" on the ground. This problem is likely to be of great importance on transport aircraft in the future, and should be carefully considered in the designs now "on the board."

Finally, there is the all-important question of replacements, which is of exceptional importance in modern warfare. Special parts should only be used sparingly, and when there are very definite reasons for not using a "standard" part, in order to ease the vital problem of replacements.

In the early days many aircraft designers considered metal stressed-skin fuselages as impracticable. Nowadays, however, there is no doubt that the problem of rapid and cheap manufacture can be solved largely in the drawing office. In the past these considerations were often left to the works, who devised ingenious and costly jigs to make parts elaborately designed.

The fuselage of the Avro Lancaster is an excellent example of the way in which production problems can be solved in the drawing office. The fuselage is split up into several sub-assembly units, some of which are further split down the centre line.

Stressing Considerations

Another example is the fuselage of the de Havilland Mosquito, which is built in halves, the split being along the top and bottom from nose to tail. Many advantages can be claimed for this method, and there appear to be no corresponding disadvantages. It is possible to employ many more on the work at the same time without undue congestion, and thus increase the rate of production. The interior is completely accessible for riveting and for the installation of some of the equipment, besides most of the plumbing and electrical wiring circuits.

The problem of "stressing" a stressed-skin fuselage is not easy, for it is not generally possible to take any successful short cuts in problems of this nature. To obtain a satisfactory analytical solution, it is necessary to accept certain fundamentals, and then work out mathematically the appropriate stress distribution.

A stressed-skin fuselage is really a hollow beam which must be capable of transmitting bending, torsion and shear stresses. It differs considerably from the usual engineers' idea of a beam, which may be described as "a member in which the flanges take the bending moment and the web the shear force." The stringers take the bending moment stresses, and the flow of shear forces must be maintained entirely by the skin. Much research work has been done

The fuselage of the Deperdussin "Seagull" monoplane, 1913, was a true wooden monocoque without internal stringers. The term is really a misnomer as applied to modern construction, with its numerous frames and stringers. A return to true monocoques by using magnesium was advocated by Mr. Digby in our issue of July 6th, 1944.

MONOCOQUES

in connection with the problem of the diffusion of stresses into the fuselage from the surrounding airframe structure.

For bending stresses the skin of the "tensile side" is assumed to be fully operative, but of the "compressive side" only a certain amount of skin can be assumed operative with each stringer. This amount is determined by the use of test results, or of some proved formula, one being the well-known one of Von Kárman. Distribution of shear and torsional stresses can be deduced from formulæ given in research reports, the methods of calculation being of too complex a nature to be explained here.

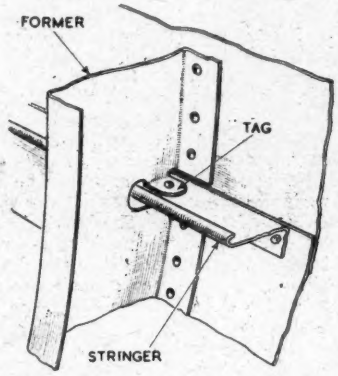
When the complete stress distribution for the whole fuselage is known, detail stressing can proceed. For this there exist excellent stressed-skin data sheets for determining buckling failures, and so on. General experience, especially knowledge of what has happened on previous production aircraft, is very important in the designing of an efficient structure.

Recently, it has been possible to check the theoretical stress distribution by means of strain-gauges. No detailed account of this will be attempted, but, briefly, the method consists of attaching to the fuselage, at specified points, small electrical resistances. When stress flows through the fuselage, a change of resistance occurs, and from this change it is possible to work out the stress value at any particular point, and, consequently, the stress distribution.

Tests so far appear to be mostly static and have not been applied widely to aircraft in flight. When this can be performed successfully, it will provide designers with valuable information obtained under flight conditions.

The general value of strain-gauge analysis lies in the fact that theory and practice can be associated, and the theory can then be applied in the sphere of progressive design.

In order to back up theory and enlarge the present state of knowledge on stressed-skin structures, mechanical tests are invariably carried out on major components. Subsequent fuselages can be modified and later designs improved in the light of information gained in the tests.



On the de Havilland Flamingo the stringer is located by a bent-up tag on the frame.

The equipment required for testing a small fuselage in "simple bending" is not unduly complicated. The front end is usually firmly secured to a strong frame, the attachment points being those normally used for the engine mounting, or the wings. By means of a system of weights or screw jacks, the aft end is subjected to different loadings and the results recorded. In view of Mr. Shanley's statement about "cut-outs," the behaviour of the skin around any access door should be carefully watched.

The tests are not necessarily carried to destruction, the loads applied being equal to a figure predetermined from the specification, or the Air Ministry's "Design Requirements for Aircraft" Manual. If, however, the aircraft under test is one of the first of a large number, the test should be carried to destruction, so gaining much valuable data. Parts failing early may be repaired and the loadings continued. This will bring to light both weak and redundant numbers, and will pay a big dividend on future production.

Testing of large aircraft requires very complicated and expensive equipment. With several of the world's largest aircraft manufacturers working on mammoth air liners weighing more than 200,000 lb., it is probable that the mechanical testing of such aircraft will evolve new techniques.

Boeing Structure Test

The structural tests carried out on the B.29 Superfortress have been described before in the technical press. Boeings' system, given below, may be taken as an indication of the procedure adopted in the testing of large aircraft.

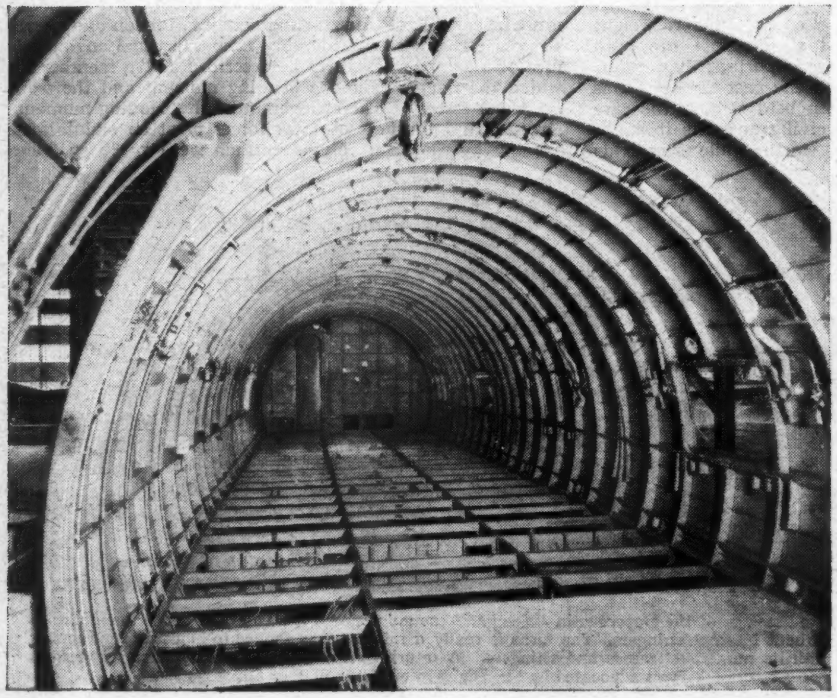
All the major airframe components were tested to destruction by models, built in full scale and complete form.

The testing to destruction is divided into three phases:—

1. The testing of component parts while they are held in special testing jigs.
2. The testing of the component parts in relation to others after they have been installed on the aircraft.
3. The testing of the complete aircraft.

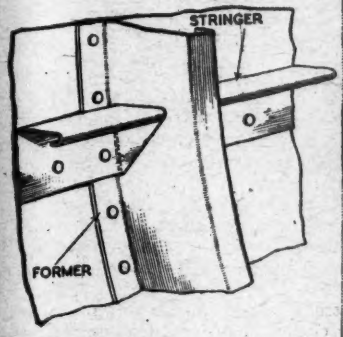
The complete aircraft is not complete in the strict sense of the word, but is rather the complete airframe.

In view of the large amount of non-standardisation of details, such as the spacing and section of the stringers and



Apart from the unusual "double-bubble" cross section, the fuselage structure of the Boeing Stratoliner is orthodox.

MONOCOQUES CONTINUED



In the Flying Fortress the frames and stringers are closely spaced, as shown on the right. The stringers pass through holes in the frames, none of the flanges being cut.

formers in a monocoque fuselage, it seems evident the most economical arrangement has yet to be found.

Many monocoques retain four longerons, or at least have those stringers reinforced which occupy the place formerly taken up by the longerons, and if carefully positioned they serve the excellent purpose of providing load carry-through members for large openings. In the case of high-powered, single-engined fighters they are necessary to transmit the highly concentrated loads of the engine mounting into the largest possible area of skin plating. Bombers require two strong longitudinal members to carry the beams supporting the bomb carriers.

A very large number of different sections are used as stringers and formers. For lightly loaded machines the Z-section stringer and former are much in evidence. For the more heavily loaded types lipped top-hat section stringers are popular.

Stringer Arrangements

There seems some doubt as to whether the stringers should be attached to the formers at the point of intersection. In theory, in certain cases, there is no need for such a fixing, as the stresses will be transmitted by the skin. In other cases there is no doubt that a positive joint results in a more stable and stronger structure. An unusual scheme is used on the Boeing Fortress. The stringers pass through holes in the formers that retain the flange of the former itself. Both stringers and formers are thus continuous over the intersection. The stringers are not joggled, but rise gently over the flange of the former at each intersection.

On the de Havilland Flamingo, notches in the formers for the passage of the stringers were furnished with a little tag that was riveted to the stringers. This was not so much a strength measure, but rather done to facilitate production, the stringer being held conveniently in place prior to the attachment of the skin covering.

It has been suggested that a saving of weight might result from the use of tubular stringers, which would also have the following advantages:—

1. No outstanding flanges, or flanges riveted to the skin, result in greater stability.
2. Mechanical properties are superior to those of strip sections.

An investigation at R.A.E., Farnborough, did prove that solid-drawn tubular stringers are lighter for the same strength, or stronger for the same weight, than constructions using stiffeners formed from strip material.

Comparative tests on panels with tubular and extruded-angle stringers showed that constructions using tubular stringers are 15 per cent. more efficient than constructions using similar extruded angle section stringers.

There has been no published evidence of a fuselage with tubular stringers. The advantages claimed must be considered in conjunction with the difficulty of riveting and also the danger of corrosion inside the tubes. If "pop" and "explosive head" rivets and anodic treatment can overcome these disadvantages, it is probable that some enterprising manufacturer will produce a specimen fuselage. It will be interesting to compare this with one of more conventional construction.

(To be concluded next week.)

MOSQUITOES' DOUBLE NIGHT ATTACKS

MORE than 50 Australians fly with Bomber Command's Light Night Striking Force of Mosquitoes, which on the nights of January 4 and 5 made two attacks a night on Berlin. The last was the force's 97th attack on the capital.

Like all the air crew of the force, the Australians are picked men, most of them having had previous operational experience, although some with special ability have gone to the force direct from training or other non-operational work.

The A.O.C. of the Force, Brisbane-born Air Vice-Marshal D. C. T. Bennett, C.B., C.B.E., D.S.O. (R.A.F.), who also commands the Pathfinder Force, said that as well as the usual medical tests the Mosquito crews had to undergo a special decompression test to ensure suitability for the heights at which the Mosquitoes of the night force fly.

The Air Vice-Marshal revealed that the Mosquitoes which carried out the daring daylight "tunnel busting" raid on New Year's Day had bombed Berlin six hours previously—an instance of the increasing scale of the Mosquito force's activities. The force was one of the largest Mosquito forces ever to bomb Berlin.

"The Mosquitoes landed, were checked and refuelled, and were off again at dawn with fresh crews to bomb the tunnels," he said. "Altogether, about 12 tunnels were attacked in the area that really mattered—behind Rundstedt's salient.

STILL AT THE VERY BEGINNING

LORD BRABAZON, in an address on "Aviation" at last week's meeting of the British Association in London, said that the jet engine, with its gas turbine, opened up new vistas of flight with revolutionising effects on aircraft design and speed, and also as power units in other fields.

"We are still at the very beginning of it all," he declared. "Not only is lavish research necessary on flight, but it is justified because it repays itself by its repercussions on and stimulation of other industries."

Undercarriages

Some Items of Interest in Landing Gear Operation and Their Effect on Design

ALTHOUGH an integral part of an aircraft, the undercarriage more often than not is a subject for collaboration by two or more concerns. In the Typhoon, for example, the retraction is by a Dowty hydraulic jack actuating a Hawker linkage arrangement fitted to a Vickers strut carrying the Dunlop wheel.

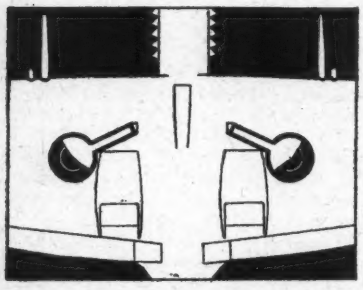
In the design of the landing gear many factors have to be considered; for instance, the disposition of the legs with regard to their fully compressed and fully extended positions, these extremes affecting the airscrew ground clearance and the wheel-well centre; then there is the retraction geometry, which is governed by the wing spar position, wing thickness, wing gun location, the aircraft's centre of gravity, etc. In addition, there is wheel size, or, rather, tyre size to be considered, and also the degree of springing movement and shock absorption.

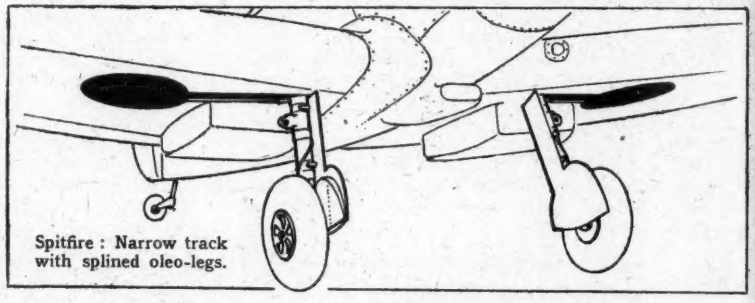
When an aircraft touches down in landing it inevitably has a certain degree of vertical velocity. Theoretically it is possible for a machine to land with no vertical component, other than that due to the weight gradually imposed on the undercarriage after landing, i.e., when the wings are no longer supporting the machine; but in practice this is virtually beyond the bounds of practicable realisation, and therefore the vertical velocity of the machine at touchdown must be dissipated in the form of energy. The aircraft designer will know fairly accurately the normal sinking speed, and, of course, he will know the weight of the aircraft. With this knowledge, plus the recommendation that the shock absorber movement should be not more than about four inches, he can calculate the resistance the shock-absorption units must have in order to dissipate the energy of the aircraft's vertical velocity. This resistance is usually kept within a value equivalent to three times the weight of the machine.

Why Undercarriages Break

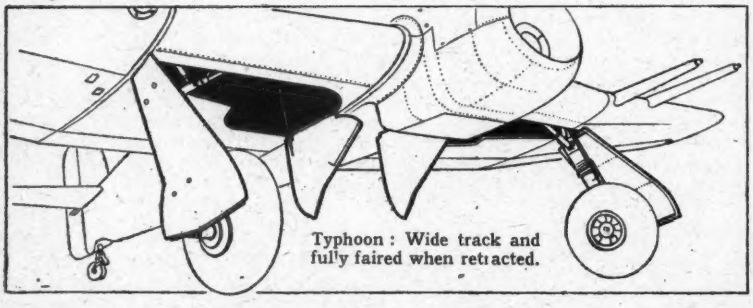
In most landings there is a certain amount of excess energy which must be cancelled out, and it is for this reason that the shock absorption resistance is arranged to be within three times the aircraft weight, this value giving a reasonable safety factor without making the undercarriage structure unduly heavy. But if a pilot drops his machine badly, then the kinetic energy to be dissipated is greater than that with which the shock absorbers can deal, with the consequence that the remaining unexpended energy goes to work on the undercarriage structure and probably breaks it.

Retractive geometry is mainly a matter of convenience within the limiting factors of the requirements of the aircraft structure, and sometimes calls for considerable

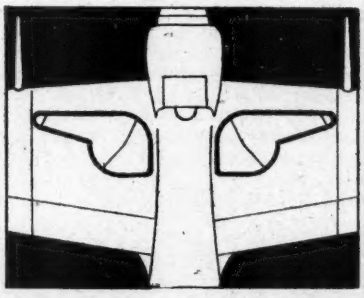


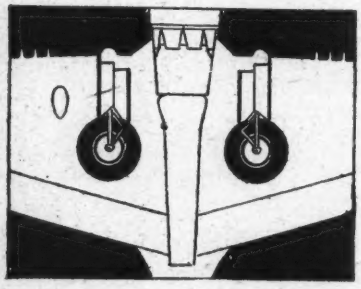


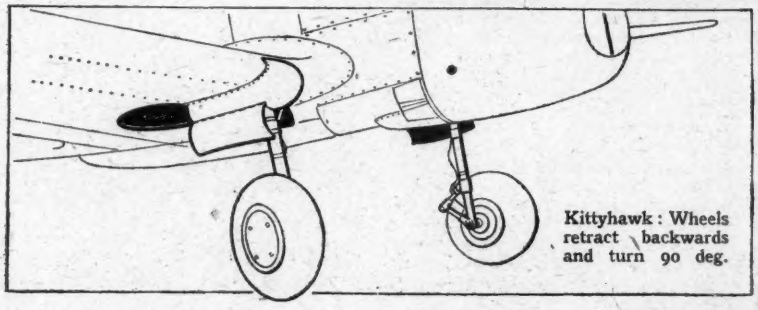
Spitfire : Narrow track with splined oleo-legs.



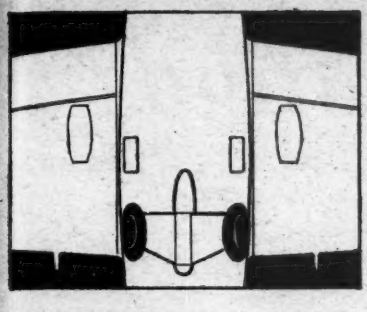
Typhoon : Wide track and fully faired when retracted.

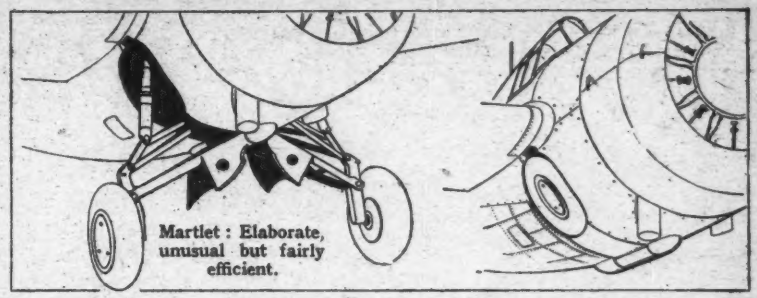






Kittyhawk : Wheels retract backwards and turn 90 deg.





Martlet : Elaborate, unusual but fairly efficient.

ingenuity, as shown in the various arrangements illustrated.

Arising from these considerations is that of wheel track, which can have a great deal to do with the docility or tractability of small aircraft when landing, taking-off or taxying. If a machine has a narrow-track undercarriage it is less stable in roll and yaw when moving on the ground than a machine with a wide track. Tendency to swing under airscrew slipstream influence is minimised by a wide track, as is also the tendency to be tipped up on one wing if a wheel hits a bump whilst taxying. In addition, when landing and almost on the point of touching down, if the machine suddenly drops a wing, and the pilot is not quick enough in bringing it up, a wide-track undercarriage will offer a far smaller likelihood of a crack-up than will a narrow track.

The modern trend in wheel mountings is towards a single telescopic oleo-pneumatic leg carrying a cantilever axle on which the wheel is fitted. This arrangement involves some form of mechanism to prevent twisting in the undercarriage leg under the influence of landing drag. It must be appreciated that the inertia of the wheel when instantaneously accelerated from rest to, say, 1,000 r.p.m. in the case of the average fighter, produces a high torque in the telescopic strut, which must be combated by some provision that will maintain the wheel fore and aft.

Most usually, the provision takes the form either of splines between the upper and lower members of the oleo-leg, or, alternatively, scissor-links likewise anchored to the two leg members. The scissor-link device is employed on almost all American machines using cantiliver axle undercarriages, whilst the internal splining in the oleo-leg is used more frequently on British aircraft, although on the Typhoon the scissor-links are used. On the Tempest the leg arrangement is rather ingenious in that it is composed of upper and lower members staggered fore and aft and joined by parallel linkages. This arrangement was necessitated by having to retract the undercarriage into the aircraft's very thin wing, and the lay-out is such that the linkage between the leg members automatically functions as a drag torque linkage. Another virtue of this particular arrangement is that the shock absorption side is accommodated by oleo-pneumatic units which are pin-jointed between the upper member and the lower link arms, so that they are thus free from any bending or torsion loads whilst, at the same time, being readily accessible.

BRITISH EMPIRE LECTURE

THE Council of the Royal Aeronautical Society has recently completed arrangements for the founding of a British Empire Lecture.

The lecture, on any aeronautical subject approved by the Council, will be delivered annually in September in London by a lecturer chosen in alternate years from the British Dominions and Colonies and Great Britain.

The Council, by founding the British Empire Lecture, are anxious to encourage new ideas and new points of view from all parts of the British Empire and to make the lecture second only in importance to the Wilbur Wright Memorial Lecture.

The British Empire Lecture will have a premium of £50 attached to it, and in the case of lecturers coming from the Dominions and Colonies an allowance up to £11 will be paid towards the lecturer's expenses.

It is proposed to hold the first lecture in September, 1945, and suggestions for lecturers should be received by May 31st, 1945, at the latest.

GLENN MARTIN'S GIFT FOR RESEARCH

AMERICAN universities are preparing to tackle post-war industrial research projects on a scale that will match their wartime record. Evidence that the war research done by universities and institutes of technical learning has already won recognition from American industrial leaders is the recent $1,700,000 gift made by the Glenn Martin Aircraft Company to the University of Maryland for further education and research in aeronautical engineering.

Earlier this year a group of private aircraft companies contributed funds for a series of research studies in aeronautical sciences at the Harvard Graduate School of Business Administration in Boston, Massachusetts. Before this the Massachusetts Institute of Technology became the first recipient of a grant for the advancement of aeronautics from All-American Aviation Inc. at Wilmington, Delaware. The All-American Aviation gift was made in memory of the late Richard Dupont, pioneer in the development of gliders.

One reason why university research services are so much in demand to-day is the fact that their laboratories are particularly well fitted to conduct what is called "fundamental" research on technical and scientific problems and precedes short-range "development" research commonly done directly in industrial plants themselves. Although universities generally agree they should continue to specialise in fundamental research, the range of subjects they are asked to cover is steadily increasing.

The division of industrial co-operation of the Massachusetts Institute of Technology, for example, has stepped from engineering into labour relations, and in the future hopes also to investigate certain aspects of market distribution. Columbia University in New York, already heavily engaged in war research, recently conducted heat transfer experiments for a number of industrial clients. Ohio State University is also conducting a new study of the synthesis of pure hydrocarbons for the American Petroleum Institute. Scientists at the marine laboratory of Duke University in Durham, North Carolina, are chiefly responsible for developing agar, a seaweed derivative resembling gelatine, into a valuable war product.

Not all research activities of universities are new developments. The University of Illinois engineering department and engineering experiment station has been doing industrial research since 1911, when it looked into coal-mining problems for the Illinois State Geological Survey Division. It is now working on projects for Government agencies as well as for private concerns. One project for the National Defence Research Committee seeks ways to dispel fog from airport runways.

Universities are more than ever conscious of the value of their research activity and are busy on new research-for-industry plans. Thus Rutgers University, New Brunswick, New Jersey, has created a research council, the aims of which are to expand existing research programmes and to encourage co-operation in research between departments in the university and organisations outside. The council will also make available to scholars and the general public the results of research done at the University. Study on new techniques for the moulding of plastics is on the immediate post-war agenda. The University of California, in Berkeley, California, is deep in discussion on how to grapple with technical problems arising out of the growing industrialisation of the west.

TRADE ANNOUNCEMENT

MESSRS. DAVID BROWN AND SONS (HUDDERSFIELD), LTD., announce that Mr. J. A. Brown, who was area office manager in Scotland and Northern Ireland for fourteen years before the war, has now resumed this position at 29, St. Vincent Place, Glasgow, C.1.

Mr. R. E. Wardlaw, who has been officiating in Mr. Brown's absence, will continue in his capacity as sales engineer.

CIVIL AVIATION

Air-Age Education

MAKING THE LAYMAN AIR-CONSCIOUS : THE NEED FOR A NATIONAL POLICY

By V. L. GRUBERG

MUCH has been written and debated on the need to provide better research and training facilities for the post-war aeronautical technician, but a much wider and, in a sense, no less important task—that of educating the future John Citizen for this air age seems to have been rather overlooked. Yet the need for air education of the layman, and the necessity of acquainting the growing generation with the changed ideas of the world for which air progress has been responsible, is certainly pressing. Without such education the best technical organisation and the greatest technological achievements will not be able to secure for this country the air position it deserves.

Aeronautical progress has completely revolutionised the accepted ideas of distance, geography, international relations, and finally of security. Just as in the 19th and previous centuries the expansion of international commerce was closely linked-up with the development of shipping lanes, so in future the intensity of commercial relations between countries and continents will be conditioned by the development of air transport facilities. Commerce will not follow the flag or the ship lane, but the trail of the transport aircraft.

By this is not implied that air transport will become the exclusive carrier of the world's goods and eliminate surface traffic, but because of its speed and flexibility it must become the bonding medium between commercial communities. The country with the better developed air transport system will have, therefore, a potential advantage. To translate this potential advantage into material terms, business men, manufacturers, engineers and salesmen will have to realise that air transport gives them exceptional opportunity of intimate contact between producer and consumer. The country whose business leaders have learnt to think of distances in terms of flying hours, and who have struck off their vocabulary such conceptions as "outposts," "off the beaten track," and "back of beyond"—only such a country will be able to retain commercial preponderance and economic strength.

The provision of a network of air services is, therefore, not adequate by itself. Nor can it be left to commercially operated air services to educate people to air travel. While no doubt the achievements of the air services in safety and speed will become publicised, and their persuasive and appealing publicity will draw larger and larger numbers to air travel, the education task is much wider.

Change of Outlook

Deep-seated tradition and ideas rooted for centuries in the minds of people have to be changed. The earth-bound outlook in travel, business and political relations which is man's burden of heritage must be swept aside and replaced by the new air age conceptions. For this reason a nation-wide educational programme is needed, with school children at its base.

Starting in elementary schools and going right through to the higher age groups, such a programme, graded to suit different age groups, should embrace the tuition in all forms of the following subjects: (1) air geography; (2) science of air (including physics and biology); (3) air mathematics; (4) elementary aeronautical science.

At first glance this sounds alarming. However, almost any curriculum looks awe-inspiring on first acquaintance. What is here suggested is not so much the addition of new subjects, but a new and perhaps broader approach and a wider and more liberal use of the "air" as a medium of tuition. To take one example: the teaching of geography, for instance, should be given a new meaning by replacing such archaic remnants as distances, directions, locations and maps based on sailing boats, by air distances, global conceptions, meanings of great-circle routes, etc. Current ideas of distances and relationship between trade centres and countries as measured in time must be completely revised under the impact of air travel. For the shrinkage of the world in terms of time is perhaps the most striking feature introduced by air transport.

In more advanced courses the study of political and economic geography would be made in the light of its changed meaning as influenced by air power and air commerce.

New Problems

Similarly in other subjects, the new factor, air, should be used as a medium of instruction and exercise, with calculations of flying time, ranges, fuel consumption, loadings, etc., serving as an inexhaustible source for interesting and practical mathematical problems.

Concurrently with this theoretical education, the practical side should embrace the construction of aircraft models from the toy stage to realistic, true-to-scale models and the study of their aerodynamic properties. Finally, practical experience should be derived from full-scale sailplanes; this might be divided into construction, servicing and actual flying, and should be made a regular feature for higher-age groups in all or most schools as part of the general training. It should not be limited to members of the A.T.C.

To feed such an educational programme a whole series of books would be wanted which would tell the young reader of the rediscovered world. Not merely the type of book showing which-is-which in the aircraft world, or how to build a model or when the first flight across the Atlantic was made, but books that will show him how aircraft have expanded his world from two-dimensional earth to three-dimensional skies. Books that show the changed significance of geographical factors.

It is obvious that such a wide programme of air education can be dealt with here only in the very briefest outline. The formulation of such a national policy is clearly not a matter for an individual or group effort. It is a national task requiring a considerable amount of groundwork and study of all relevant factors and possibilities. To begin with, however, it should not be impossible to bring together a committee of aeronautical experts, educationalists and representatives of export and trading interests who would take upon themselves this arduous but vitally essential task of breaking new ground.

One may participate already the criticism of the sceptic that after all, there is no need for everyone to become an aviator. Indeed there is not. But does the teaching of geography or of Scripture necessarily induce all pupils to become explorers or parsons?

What is needed is an educational programme aimed at helping the growing generation to understand the world as it is to-day, and not as it was yesterday; an understanding that can be achieved only if it is based on three-dimensional thinking.

Air transport means more than just another method of locomotion. It not only provides us with faster and more

AIR-AGE EDUCATION

direct travel, but it has extended the sphere of human activity to a new element. Since this element is not regional, as are waterways or sea lanes, but universal, it will permeate and determine our future civilisation more generally than any other technical innovation since the development of the wheel.

If our educational system ignores this fact, it will commit the mistake of producing a generation which is not aware of its own potentialities, and which, therefore, will be outpaced, outflown and out-traded by others more vigilant.

Many of the suggestions noted here are not original. Many people in this country are already alive to the need of a wide policy of air education. Across the Atlantic, however, considerable efforts have already been and are being made in this direction. One has only to glance through a list of current American publications to realise with what drive and vigour they are launching their "air-conditioning" campaign. Even if these efforts are prompted by a desire to build up a potential clientele for the vastly expanded American aircraft and airline industry, that does not discredit them in the slightest, nor deprive them of their significance. So much more credit indeed to the men in American aviation who have enough vision to realise that the future of air transport and the prosperity of their nation will not be exclusively determined by old-established methods, routine procedures, and the occasional publication of prosaic memoranda by men long trained in the art of discreet and cautious approach. Not even cheaper rates, faster services or proud traditions will ensure the future of air transport and commerce; it needs a new, young and dynamic approach.

CIVIL AVIATION NEWS

PLANNING

THE Portuguese Director of Civil Aviation has approved a scheme to build a great international airport at Faro, on the Portuguese South Coast in the Bay of Cadiz.

NEW YORK TURN OVER

THE New York La Guardia airport handles daily 200 domestic air service aircraft and 20 to 30 transatlantic airliners.

It is expected that the daily total will soon surpass the peak figure of 248 flights reached in autumn, 1941.

U.S. RESULTS

PASSENGERS carried by 14 domestic American airliners during 1944 totalled 3,658,140. Excluding strictly military tonnage, these airlines also carried 62,133,104 lb. of express and have flown in transport of air mail 85,803,300 lb./miles.

These figures represent record achievements despite the fact that the airlines had to operate with limited equipment, and better results are expected in 1945.

CANADA'S NEWEST AIRPORT

A NEW four-mile-square airport has been completed by the United States Army outside Edmonton, for use by the United States, and to be turned over to Canada after the war. The airfield is ten miles from Edmonton, and is said to be capable of handling the largest aircraft being built or to be built.

Two runways are 7,000 feet long, and the airport has nothing higher than farmers' barns on its ten-mile approaches.

The field went into operation at the end of November after more than a year of building, and was only taken off the secret list early in December. It is being used in part for handling Lend-Lease aircraft flying to Russia. It is operated by the United States Army Air Force.

Edmonton has in addition to this field also one of the largest municipal airports on the continent and a Royal Canadian Air Force base. Currently Edmonton claims to be the busiest air centre in Canada, with largest volume of air traffic. Plans are now being studied to allow Edmonton to retain this position as a busy air traffic centre in the post-war period.

CANADIAN SURPLUS SALE

WAR ASSETS CORPORATION, Canadian Government established company, has sold 209 surplus Royal Canadian Air Force aircraft, one Link trainer, and an amount of spare parts and aeronautical equipment.

Top prices were paid for two Grumman Goose amphibians each fetching $35,000. One went to Ecuador, and the other to a transport company in Canada. A Beechcraft was sold to a commercial airline in Canada for $16,500, and five Lockheeds were sold at an average price of $15,000 each.

Nearly half of the 185 trainers sold will be "cannibalised" and used for replacement parts. Most were sold to purchasers in Mexico, Brazil, Ecuador, Peru and in the British West Indies. As the type is no longer manufactured in the Dominion, and with spares and replacements not available, their value and usefulness in Canada had greatly diminished. Although not specified in the release, they are likely to be Fleet elementary trainers and some de Havilland Moths.

AMERICAN EXPORT AIRLINES

AMERICAN Export Airlines have resumed commercial operations on their transatlantic route.

On December 31st their contract with the United States Navy Air Transport service expired, but all location remains with the U.S. Navy priority board, which has the first call for all space.

Any aircraft spare space, however, will be allocated to non-priority passengers and freight.

CO-ORDINATION

ALL Argentina's military and civilian aeronautical activities will be concentrated under an aeronautical general secretariat directly responsible to President Farrell under a new Government decree.

Commodore Bartolome de La Colina has been appointed Aeronautical Secretary, with the status of Minister of State.

COMMONWEALTH UNITY

CLOSER air co-operation between members of the British Commonwealth is gradually emerging as a result of talks conducted after the Chicago Conference at Montreal and London.

Following the recent creation of an interim Commonwealth Air Transport Council, the setting-up of a permanent Commonwealth civil aviation body is envisaged for the immediate future.

PAN AMERICAN'S TYPES

SOME of the specifications and operational data of Pan American Airways 149-passenger "Type 10" aircraft, which would be used in proposed long-range over-water flights, have been released.

Following are the specifications for the "Type 10" and comparisons with the DC-7, the Lockheed Constellation, DC-6, and DC-4:—

	TYPE 10	DC-7	Constellation	DC-6	DC-4
Gross weight	184,000 lbs.	162,000 lbs.	96,100 lbs.	80,500 lbs.	71,300 lbs.
Power take-off	14,000 h.p.	14,000 h.p.	10,400 h.p.	8,400 h.p.	5,800 h.p.
Normal ...	11,200 h.p.	11,200 h.p.	9,000 h.p.	6,800 h.p.	1,100 h.p.
Cruising speed	288 m.p.h. at 64.3% of h.p. at 25,000ft.	296 m.p.h. at 64.3% of h.p. at 20,000ft.	322 m.p.h. at 62% of h.p at 20,000ft.	325 m.p.h. at 62% of h.p. at 20,000ft.	239 m.p.h. at 60% of h.p. at 10,000ft.
Passengers carried	149 maximum trans-atlantic 128 day, 119 night (30 berthed)	108 maximum trans-atlantic 95 day, 79 night (20 berthed)	56 maximum trans-atlantic 40 day, 30 berthed	50 maximum Night: 24 berthed, 2 sit up	44 maximum Night, 22 berthed
Cargo capacity	2,082 cu. ft.	1,169 cu. ft.	882 cu. ft.	—	—
Crew ...	11	10	6	6	5
Cost ...	$2,029,488.00	$1,412,488.00	$727,288.00	—	—
Operating cost per available ton mile 2,000 (Eire-Newfoundland)	10.9c.	13.7c.	16.9c.	20.6c.	15.7c.
2,500	13.1c.	13.8c.	17.0c.	25.3c.	15.8c.
3,000	14.3c.	14.0c.	17.6c.	Range limited to 2,715 miles	19.1c.
3,500	17.4c.	16.9c.	49.3c.		27.2c.

(Westbound non-stop 35 mi. h.w.)

"Indicator" Discusses Topics of the Day

Pre-planning Perfection

Civil Aircraft Development by Stages : Rationalising Layout : Essential Simplification : Comfort and Convenience for the Crew : Unnecessary "Automaticity"

WHILE looking around, flying as passenger in, and handling the present-day aircraft, it is difficult not to feel, rather uncomfortably, that the whole thing is getting slightly out of hand. During a major war, when the immediate production of effective fighting and bombing machines is the only consideration, almost anything can be forgiven, but in the more leisurely days of peace there will be no excuse for some of the jury-rigged layouts which are inevitable when no long-range planning or redesigning is possible.

Before the detailed planning of a transport aircraft can even be started, final and irrevocable decisions must be reached, first of all, about what is actually wanted in the way of general equipment. If, for instance, we are to avoid the necessity of carrying half-a-dozen different kinds of radio sets, the world's airline operators must decide on a standard series of radio-navigational systems which can be used everywhere: a long-range communication and direction-finding system, perhaps, and a universal type of beam-approach equipment for a start. Let us hope that the international signals experts, who will make up the personnel at the preliminary conference, are a little less bad-tempered and a little more tolerant than the average amateur or professional politician. Since the majority of them will be scientists there is hope that tribal emotions will not unduly colour the findings of the meeting.

Having arranged a broad basis of necessities for international air navigation, it will be time to call a conference, of a slightly more localised nature, at which the operators, their technical people, the designers, and representatives of the pilots will decide on the layout of the major items, on the need or otherwise for additional radio guides of the contour-chasing "gen-box" kind, and on the type of automatic pilot to be fitted. Then the technicians, the radio operators and flight engineers will arrange the broad layout of the whole driving compartment without entering into too much detail. Finally, the works designers, the works test pilots and the airline company's senior pilot will develop, day by day, the detailed arrangements from mock-up to prototype stage.

Democracy and Decisions

These are only suggestions. The important point is that each of the conferences must involve the *smallest* number of people consistent with the obtainment of worthwhile opinion—otherwise decisions will never be reached, and the meeting will end in democratic free fights. Each conference will be a kind of practical and intellectual oligarchy in itself, and the decisions will be final. Until the penultimate stage is reached, it will hardly be possible to design the fuselage—since roominess in certain directions will be essential to good planning—but at least the final results should be satisfactory to all.

More important still, a pre-planned aircraft will not suffer from the usual untidy mass of etceteras which have for so long been a homely feature of the average British machine. Yet, if the pilots are allowed a fair say in the matter, the "homeliness" will still be there in practical form. It is almost as important to avoid the technically tidy complication of the aircraft designed, as a whole, by designers as it is to avoid the untidy complication of an aircraft which has been planned piecemeal—first by designers, and then altered, as an afterthought, by the people who actually have to fly the things. The beautifully ingenious layout of the perfectly planned control-cabin may be a pilot's nightmare if the technician, with an eye only to maintenance and production simplicity, is given his head.

At almost any cost, the criminal business of adding bits, during development or even during later operation, must not happen in the future. Let us remember what has happened to so many military aircraft which, once a joy to handle, have become a horrid mass of devices impeding both movement and vision in the cockpit. By way of a lesson, let us take two examples of well-known and excellent machines which military expediency and the steady development of combat devices have now filled to overflowing.

Military Necessities

The first is a single-seater fighter. Once upon a time the trimmers and the throttle, the mixture, c.s., undercarriage and flap controls were nicely placed, and the view, despite the inevitable reflector sight behind the small bullet-proof screen, was good enough. Now, the view is almost completely obscured by a most useful and ingenious gyro gun-sight, the cable controls for which envelop the left side of the cockpit and prevent one from reaching the flap control, while its massive mounting partially blanks out most of the instrument panel. An unmentionable box of radio tricks may prevent one from pushing directly at the throttle; more radio oddments catch one's glove while grabbing for the undercarriage lever; and one's right knee brushes uncomfortably against overload-tank jettison levers and cocks. Every square inch of space has been utilised—but there will still be room for anything else for which a need is dictated by military necessity.

The second example is a redoubtable multi-purpose, twin-engined affair. Even in its earlier unequipped phases the pilot felt rather as if he was "sitting at the mighty Würlitzer," but everything was nicely to hand or elbow, and the view was magnificent, even if the controls *were* rather spaced evenly all round the pilot, as many behind him as in front. Gradually, however, its magnificent "multipurposility" has filled up even the remaining spaces with patent sights and their controls, explosive-dropping releases, radio devices, and all the paraphernalia of offensive armament into which the pilot squeezes with difficulty if he is not too well-built. Of course, the pilot learns to feel at home in it all; man will learn to feel at home anywhere—such is the flexibility of the nature of the beast.

But the transport pilot of the future will not be at war; he will not be flying merely "for the duration" and to help out the regular Service, and he will be flying for quite a few hours every day of his life—not twice a week. He will expect, and rightly demand, comfort and convenience. On long flights he will need to leave his seat quite often to talk to the passengers or to the other members of the crew; he or his second pilot may, on the other hand, be left in charge, with an unserviceable gyro pilot, for quite long periods; there must never be any possibility of a mistaken switch or control; and, above all, his view must be perfect in all conditions of rain, ice, internal misting and aircraft attitude. It will be uncomfortable but chastening to note that an American aircraft, designed many years ago, is still almost the only one to satisfy those last conditions, and that one of our latest transports can be almost dead blind for the pilot in some kinds of bad weather.

Probably the most difficult decisions for our Brains Trusts to make will be those concerning general layout and

PRE-PLANNING PERFECTION

equipment requirements. A happy mean must be found between over-complication from the pilot's and flight engineer's point of view, and any "over-automatisation." It is, even now, possible to design an aircraft which will do practically everything for itself, from the take-off to the landing, but every development of automatic control involves further cost, further weight, and further chances of failure. With economy of operation so essential, and with aircraft, by themselves, so expensive in first and later costs, human judgment, eyesight and muscular dexterity are still cheaper to maintain, and possibly, so far, more reliable than any radio-mechanical devices can be in their present stage of development. The automatic pilot, in its simpler form, will be an essential on all long-distance aircraft, but, with the limitations already imposed by weather and the concomitant ice-forming conditions, there is, as yet, little advantage to be gained in trying to go much farther.

For the time being, and until air transport is really finding its feet, simplification should be the aim, while making everything as easy and safe as possible for the human crew. "INDICATOR."

[The concluding paragraphs of "Indicator's" article above express much the same sentiments as those voiced by Mr. W. P. (now Sir William) Hildred in his talk to the Royal Aeronautical Society during the recent debate on civil aviation. He, too, was wondering whether all these modern mechanical aids were having the right effect on pilots, and said we must ask ourselves whether a future commercial aircraft should be capable of navigating itself, or whether we should pass over to a state of affairs in which the aircraft was "nothing but a bead running along a string." He was obviously rather perturbed at all this modern "instrumentalisation."—ED.]

Your Future in Civil Aviation

A Useful "Gapan" Booklet for Air Force Personnel

MANY hundreds of young men at present serving Britain in military aviation are, very naturally, hoping to find a peacetime future in civil aviation. *Flight* is constantly receiving letters from members of the R.A.F., Fleet Air Arm, the Dominion air forces, and the A.T.A. seeking information and advice on this subject.

We particularly welcome, therefore, the appearance of a little booklet prepared by the Guild of Air Pilots and Air Navigators of the British Empire—more compactly known as "Gapan"—bearing the title "Your Future in Civil Aviation," which summarises the opportunities likely to be offered by post-war civil aviation to flying personnel and ground crews at present in the various air Services.

It is obvious that some aspects of the subject cannot yet be covered with any degree of certainty, but the booklet sketches the general picture so far as it can be foreseen by the Guild at the present time. In this, care is taken not to encourage excessive optimism. An appraisal of civil aviation prospects is made, some of the classes of employment which are likely to be open are discussed, and the problem of matching post-war civil opportunities with wartime resources is examined. Indeed, one of the chief purposes of the booklet is to help in bringing about an adjustment of these two fields of supply and demand. The remainder of the booklet is largely devoted to those practical steps which members of the Services can take in order to fit themselves for civil aviation employment and in order to obtain it.

A note of warning against over-estimation of the opportunities likely to be presented by civil aviation within the first year or two after the war is also sounded by the Director of Civil Aviation in a preface to the booklet, in which he points out that "no precise estimate can yet be made" of their range or number, and that the only wise expectation is that they are likely to be few. "I wish to emphasise," he says, "that no optimistic picture should be painted of the intake capacity of British civil aviation in the immediate post-war period," and he welcomes the booklet as "a sober and useful contribution to the preparations for post-war adjustment."

A particularly useful section is that devoted to the requirements for obtaining licences of various kinds, and there is a chapter on conversion courses which no Service pilot, navigator or wireless operator with civil flying hopes should fail to absorb. About half of this chapter has been contributed by Air Vice-Marshal Bennett, and some of the chief differences between the needs of civil aviation and those of Service flying are pointed out. Many of these differences are consequent upon the fact that safety and economy have a very much higher priority in the former sphere than in the latter, but there is also a marked difference in regulations and procedure, with a wider degree of responsibility upon the individual in civil than in Service work.

Of pilots, A.V-M. Bennett says that those with Service experience on heavy night bombers or in Coastal or Transport Command will be the most readily acceptable of all categories. But he adds the warning that they will, in most cases, need to learn a lot more about navigation, while navigators should, if possible, "take steps to obtain flying instruction." He also warns wireless operators that "the speed and reliability required in civil aviation is far higher than standard Service working," but adds that any normally good operator would get used to civil procedure in a matter of a few days.

Incidentally, the Guild, which is ready to help any applicant, whether a member of "Gapan" or not, is anxious to know how many Service personnel are interested in a future in civil aviation, but applicants will be well advised to read this booklet first, and then send their particulars to the Guild, c/o the R.Ae.S., 4, Hamilton Place, London, W.1. Normally, a charge of 1s. is made for "Your Future in Civil Aviation," but R.A.F. messes and F.A.A. units can have copies free.

FIGHTER ACE TRAINS V2 BUSTERS

GRP. CAPT. ARTHUR HAY DONALDSON, Battle of Britain and Malta fighter veteran, holder of the D.S.O., D.F.C. and bar, and the A.F.C., is the man behind R.A.F. Fighter Command's recent pinpoint bombing attacks upon German V2 installations in occupied Holland.

A cousin of Wing Cdr. Douglas Bader, D.S.O. and bar, D.F.C. and bar, the legless fighter ace, he is an expert on pinpoint bombing technique. He has studied all types of fighter-bomber assaults, many at the receiving end. In Malta he observed the tactics used by the *Luftwaffe* in their dive-bombing attacks on the island's airfields.

As commander of one of the Fighter Command sectors from which V2 busting squadrons make their sorties, Grp. Capt. Donaldson has been responsible for training pilots and for planning many of the missions.

He joined the R.A.F. in 1934, after spending a year with Vickers, and made his first operational flight as a member of Wing Cdr. Bader's squadron. Later he was given command of the first of the R.A.F.'s Whirlwind squadrons, and then went out to Malta to form and lead the first fighter wing to operate there.

One of the highlights of his leadership of the Malta wing was the destruction in four days of 51 enemy aircraft without the loss of one of our pilots. Grp. Capt. Donaldson himself had many hair-raising experiences in combat and was shot down several times.

The recent successes of his V2 busting squadrons coincide with his first anniversary as commander of the sector.

UNITED STEEL APPOINTMENT

THE UNITED STEEL COMPANIES, LTD., announce that their research activities, including those relating to metallurgy, applied mechanics, and manufacturing processes, are now to be unified and co-ordinated under a single control, in which circumstances the position rendered vacant by the death of Dr. Swinden becomes one requiring experience of a general nature rather than of an essentially scientific character.

Mr. Frank H. Saniter, B.Sc., has been appointed director of research to the company and he will take up his duties immediately. He is the son of the late Mr. E. H. Saniter, who will be remembered as having been chief metallurgist to the United Steel Companies, and who was awarded the Bessemer Gold Medal in 1910.

The Use of Airborne Troops

Sir B. Montgomery's Reflections

By MAJOR F. A. de V. ROBERTSON, V.D.

IT is very interesting to see how both sides—the Germans and the Allies—use their airborne troops in land battles, not having dropped them from the sky. They use them with great advantage. The danger with an airborne force is that it is kept out behind somewhere. All their thought and training and philosophy is built up in flying over to the battle and landing there. That is the approach to the battle. It is what happens when they get on the ground that is difficult."

So said Field Marshal Sir Bernard Montgomery in a Press interview the other day. As he spoke he was wearing the maroon beret of British airborne forces and the silver "wings" of the Parachute Regiment, of which he has lately been appointed Colonel Commandant.

The gifted Field Marshal evidently looks on airborne troops as a sort of corps d'élite, and he made special mention of the fighting recently done by the British 6th Airborne Division and the U.S. 101st and 82nd Airborne Divisions. The 6th landed in Normandy on the Allied left flank on D-Day, was later recalled to England to refit, and has recently been fighting south of Rochefort.

Earlier in the war representatives of *Flight* had a chance to visit the 1st Airborne Division during its training, and heard Gen. Browning explain that the men were essentially soldiers The aircraft were merely the means of getting them to the desired spot, and the "difficult time" came after they had landed. Recent experience has shown that the proper way to use airborne troops is for surprise, and as an "arm of opportunity"—to use a phrase once applied to horsed cavalry. Eindhoven, Nijmegen, and Arnhem showed that the success of the surprise depended on whether the ordinary ground forces could reach and relieve the airborne men before the enemy could take advantage of their unique position, almost cut off from a base. The men carry supplies sufficient for so many days, and these supplies can in favourable circumstances be augmented by further canisters dropped from the air. They are also men chosen for their toughness, and trained to endure hardships such as hunger and thirst for a period longer than ordinary troops would be expected to put up with them. Their skill at arms has also been highly developed, and even the glider pilots are experts with many varieties of weapons. Naturally, when employed among ordinary ground troops, they have outstanding merits, as the Field Marshal pointed out.

Employment in Line

The report of Sir Bernard's address appears to represent him as thinking that it is a waste to hold such tough fighters in the rear, waiting for another chance to fly behind the enemy's lines and come down there. He probably did not mean that, even though he expatiated on the "great advantage" both the enemy and the Allies have derived by using airborne men in land battles without having previously dropped them from the air. It would only be human nature for a General to want to have the best troops he could get hold of; and in an emergency, such as that of the defence of Bastogne by the U.S. 101st Airborne Division, it is obviously only ordinary prudence to employ the very best for a critical job. Less good troops might have lost that position, and in losing it have lost far more than the position itself.

On the other hand, it would be wasteful always to use one's corps d'élite in every fight. In Tunisia the regiments of the Brigade of Guards earned the nickname of "The Plumbers" because it was repeatedly their duty to plug holes in the Allied line. Men who do that sort of job need to be kept for that sort of job, while more straightforward fighting is left to ordinary line regiments. We are not attempting to depreciate the ordinary line regiments of the British Army. We know that they are very good indeed. What we are suggesting is that it is usually a mistake to use specialists for non-special jobs. If they are mauled, they may not be in a fit condition to do their own special work when there is urgent need for it.

One may mention some instances in the past where that happened. Kitchener was criticised for having launched the 21st Lancers in a charge at the battle of Omdurman, as a consequence of which, it was said, there were no cavalry available to pursue the Dervishes when they broke and fled. Again, in 1914, at the battle of Neuve Chapelle, the Indian Sappers and Miners were thrown in to fight as infantry. It may have been necessary and unavoidable in the emergency; but their losses may well have hampered the whole division when engineering work was needed on subsequent days.

Missing Opportunities

In the same way, an airborne division which has lost heavily while fighting on the ground is not likely to be in good trim if soon afterwards an opportunity occurs for a surprise landing behind the enemy's lines. It is obvious that they must fight hard when they are on the ground; but it would seem to us desirable that they should be extricated so soon as the immediate object has been attained and the normal ground forces have linked up with the airborne men. The latter should then be refitted and held in readiness for the next chance of using them in their own special way. This was done in the case of the British 6th Airborne Division after it had made its landing in Normandy on D-Day. It should always be done, whenever practicable.

At the same time it should be realised that when a division comes down from the air most of its gliders have to be left on the spot where they land. Refitting the division therefore includes the provision of new gliders. Unless there are sufficient gliders ready in the stores depots the division will have to wait until the factories have turned out a sufficient number before they can operate again from the air. This consideration detracts somewhat from the urgency of withdrawing the men from the fighting line. The most important consideration of all, however, is that such highly trained men should not be decimated in doing work which ordinary infantry are quite competent to undertake.

In this connection it should be noted that Field Marshal Montgomery told in his interview how he had consulted with General Hodges, of the U.S. 1st Army, and persuaded him to withdraw the two U.S. airborne divisions, saying: "They will be swamped. They will disappear. They have done their stuff. They are great fighting men." Any division needs to be relieved after a certain amount of fighting; airborne divisions may be able to stand the strain longer than others, but it is even more necessary not to work them to death—for they are specialists.

SEABEES' THIRD BIRTHDAY

THE U.S. Navy's Seabees—the men who have gone in with all the major invasions in Europe and the Pacific to unload supplies and build and defend all sorts of facilities, including airfields—recently celebrated their third birthday. Their total strength is now more than 70 times their original number of some 3,300 men.

The U.S. Navy Secretary, Mr. James Forrestal, in a message to them, said: "On this third birthday of the Seabees I extend my congratulations to an organisation which chose for its motto the words 'Can Do,' and then proceeded, by courage, skill and hard work, to live up to it."

CORRESPONDENCE

The Editor does not hold himself responsible for the views expressed by correspondents. The names and addresses of the writers not necessarily for publication, must in all cases accompany letters

IMPLICATIONS OF V2

Calculations Corrected

IN my recent letter concerning the implications of V2 published in *Flight* dated January 4th the subdivision of the load of the small one-ton rocket should have been pounds and not kilogrammes, the 2,000 lb. all-up weight being in round figures instead of 2,240, and the subdivisions likewise.

A printer's error arose, also, with the equation of mass ratios where $e.\frac{V}{v}$ as printed should read, of course, e to the power of $\frac{V}{v}$

E. BURGESS
(President, the Combined British Astronautical Societies).

CROPPED AIRSCREW BLADES

An Advantage of Wood

AFTER seeing the photograph in *Flight* (January 4th) of the Spitfire with "cropped" airscrew blades due to a little sea-hopping at rather too "negative" an altitude, I cannot help thinking that wooden blades in an airscrew have an advantage over the metal variety in a rather interesting manner. The very fact that the blades on this particular "Spit." *were* wooden and portions "snapped off" on impact with the sea surely enabled the pilot to continue back to base for, had they been of metal, would they not have buckled badly or "bent back," thereby causing vibration and probably complete loss of efficiency?

The wooden blades having "lost" their damaged section can continue functioning, and the reduced blade area seems likely, in most cases, to be sufficient to maintain flight. I cannot visualise a single-engined aircraft flying far with heavily buckled metal airscrew.

Maybe I'm wrong, but it's a point which I thought may be of interest to readers.

V. H. IZART.

PLUGGING

Credit Due to AC-Sphinx

WE were very interested to observe that, in *Flight*, December 21st, you make, on page 654, editorial mention of President Roosevelt's message to Congress of the high quality of the British-made sparking plugs fitted to Flying Fortresses taking off from British bases since 1943, but we were astonished to observe that in the concluding paragraph on that page you refer to two of our competitors with a clear inference that the plugs in question were made only by these two firms.

We are rather surprised that your information should be so incomplete, as this company has made and supplied a quantity of these plugs appreciably in excess of the number supplied by at least one of the makers to whom you refer.

We feel you will probably also be interested in the following point. Arising out of the experimental work on aircraft plugs done by this company just prior to the war, we developed what we feel can be regarded as the most outstanding basic invention in plug design over the past 25 years. It consists of casting a silver core into a cavity within the nose of the ceramic insulator and thus goes a long way towards achieving a widening of the operating range of the plug between the fouling and pre-ignition points.

This feature was the invention of our works director, Mr. D. H. Corbin, and under arrangement with the Ministry of Aircraft Production, the rights to use the invention were accorded to our two competitors whom you mention in your editorial.

This silver core feature has, to our knowledge, been used on practically all the plugs to which President Roosevelt referred, which certainly supports the claim, which we unhesitatingly make, that the silver core is largely responsible for the success of all the three makes of plug. We would also mention that this silver core feature is similarly being used on the overwhelming proportion of the aircraft plugs made by the three companies (K.L.G., Lodge and AC-Sphinx) for British aircraft engines.

There is just one further point. In the course of our aircraft plug development work—and this applies particularly to the period over which the silver core feature was developed—we received the unstinted help of the Bristol Aeroplane Company. The contribution of the engineers of that company—in particular, their Mr. H. C. Mansell—has been an important factor in the successful manner in which British aircraft sparking plugs have performed during the war.

We feel quite sure that you will wish to give to the above information the same editorial publicity that you have given to the subject in the editorial columns of your December 21st issue.

N. F. STOCKBRIDGE,
Managing Director,
AC-Sphinx Sparking Plug Co., Ltd.

[While regretting our information was not complete, we suggest our correspondent must blame the Sphinx-like modesty of his famous firm.—ED.]

ABOUT AMPHIBIANS

Is the Wheeled Float a Solution?

I AM sure that most of us will agree with "Indicator" when he states in his article, "About Amphibians," that the chances of unsticking the small amphibious boat, with its high load/horse-power ratio, are sportingly small.

By keeping, however, to the pros and cons of this type of amphibian only, he rather leads us to suppose that there is no other line of country open to us in our search for the solution of the small amphibian problem.

I feel that many of us would like to hear his views, if he would tackle the job from an entirely different angle. I would ask him to carry his mind back 20 years, to the amphibious Fairey Flycatcher. This aircraft had floats (presumably self-supporting, or more or less so, when airborne), with landing wheels let into the centre of the floats, protruding sufficiently to give the floats ground clearance. There was no additional weight from duplication of undercarriage struts and bracing, as the one rig accepted the load from floats or wheels.

With 20 years of aerodynamic research and float design available since this aircraft flew, what is "Indicator's" opinion of the above system, or something akin to it, as being the solution to the wants of the amphibious-minded small aircraft operator?

C. G. HANCOCK.
(Pilot, J. Brockhouse and Co., Ltd.)

CIVIL AIRCRAFT ENGINES

Limited Choice of British Products

I HAVE read with much interest the article on the above subject by John Morrison in *Flight* of December 21st and 28th, but I cannot possibly let the statement in the second part of his article pass unanswered, where he states that I have inferred that Hercules engines are unsuitable for air transport operation. The statement made in my article (*Flight*, August 10th) was: "The air-cooled radial engine, which is obviously more suitable and in greater favour, has not yet been considered for the York." In my answer to Mr. Pollitt's article my reply given in *Flight* correspondence (September 14th) was: "The Merlin engine of 27 litres is too small for large civil-type aircraft; the Hercules of 38.7 litres was much nearer the mark"; and, finally, that I was suspicious to find no evidence that the purely military power-plant with British air-cooled radial engines had been tested in the York.

It must be remembered that not only are we seeking to find suitable aircraft for post-war civil aviation, but also suitable engines. There is not a wide choice of British engines; in fact, there is only one choice in the air-cooled radial types.

The size and power is about the same as the Hercules, and for aircraft of the York size this is the only engine of its type and power available in this country.

This engine, as far as general workmanship is concerned, is second to none in the world, but this is not the designer's credit. I repeat that the design has not been tested in the same thorough manner as the Merlin, and in that respect it cannot be regarded as a successful competitor in the field of international competition for post-war civil aviation. It seems that those who are now trying to build the foundations for British civil aviation cannot possibly be aware of the true position in the industry.

So in reply to Mr. Morrison I would say that the Hercules, for type, capacity, and power, is ideal for civil air transport operation.

C. H. POTTS.

LOST LIAISON : The effect of bad weather upon air support is well illustrated by this picture of Piper Cubs in France, grounded by torrential rains.

SERVICE AVIATION

Royal Air Force and Fleet Air Arm News and Announcements

S.H.A.E.F. Air Appointment

IT is announced that Air Marshal H. E. P. WIGGLESWORTH, C.B., C.B.E., D.S.C., has been appointed Deputy Chief of Staff (Air) at S.H.A.E.F.

Air Marshal Wigglesworth was appointed Senior Air Staff Officer, H.Q., A.E.A.F., in November, 1943.

Awards

THE KING has been graciously pleased to approve the following awards in recognition of gallantry displayed in flying operations against the enemy :—

Bar to Distinguished Service Order

Act. Wing Cdr. J. BLACKBURN, D.S.O., D.F.C., R.A.F.O., No. 159 Sqn.—This officer has an outstanding record. He has completed five tours of operational duty. He has commanded this squadron for the past few months, and during the period has participated in a number of bombing attacks and several mine-laying missions. During these operations, despite very bad weather, not once has he failed to attack his allotted target. Both in the air and on the ground his example has proved inspiring. His genius for leadership, great skill and fine fighting spirit have contributed in good measure to the high standard of efficiency of the squadron he commands.

Distinguished Service Order

Act. Sqn. Ldr. J. H. COLLIER, D.F.C., R.A.F.V.R., No. 10 Sqn.—In air operations this officer has displayed bravery, fortitude and devotion to duty in keeping with the best traditions of the Royal Air Force.

F/O. C. M. HAY, R.C.A.F., No. 432 (R.C.A.F.) Sqn.—One night in September, 1944, F/O. Hay was the navigator of an aircraft detailed to attack Pottrop. It was his third operational mission. Whilst over the target the pilot was severely wounded and lost control of the aircraft, which went into a dive. Displaying great promptitude, F/O. Hay took over the controls and succeeded in levelling out. Although inexperienced as a pilot and despite the fact that some of the instruments were unserviceable, he flew the aircraft back to an airfield and landed it. On touching down the under-carriage collapsed and the aircraft caught fire, but the crew got clear uninjured. This officer displayed great coolness and resource and was undoubtedly responsible for the ultimate safety of his comrades.

Act. Wing Cdr. W. P. GREEN, D.F.C., R.A.F.O., 219 Sqn.—This officer has displayed the highest standard of keenness and devotion to duty in operations against the enemy. Since being awarded the D.F.C. Wing Cdr. Green has completed a large number of sorties. His successes include the destruction of seven enemy aircraft, three of which he shot down one night in October, 1944. His sterling qualities have been well reflected in the high standard of efficiency of the squadron he commands.

Act. Sqn. Ldr. A. S. DREDGE, D.F.C., R.A.F.V.R., No. 3 Sqn.—This officer has led the squadron on a very large number of sorties, involving attacks on a wide range of enemy targets. Shipping, airfields, locomotives and various other targets have been most effectively attacked. Throughout these operations, Sqn. Ldr. Dredge has displayed inspiring leadership, great courage and determination, qualities which have contributed materially to the successes obtained.

Act. Sqn. Ldr. D. H. HAMMOND, D.F.C., R.N.Z.A.F., 489 (N.Z.) Sqn.—Since being awarded a bar to the D.F.C. this officer has participated in several attacks on enemy shipping. In August, 1944, Sqn. Ldr. Hammond led formations of aircraft on three such missions. On each occasion loss was inflicted on the enemy. In September, 1944, he led a large formation of aircraft in an attack against enemy shipping in the harbour at Den Helder. In this well executed and successful operation, Sqn. Ldr. Hammond displayed brilliant leadership, great skill and determination. He has rendered magnificent service.

Bar to Distinguished Flying Cross

Flt. Lt. R. J. CLARK, D.F.C., R.C.A.F., No. 571 Sqn.—This officer has participated in a very large number of operational missions and he has invariably displayed a high degree of courage and resolution. One night in October, 1944, Flt. Lt. Clark was the navigator of an aircraft detailed for a mine-laying mission. The operation necessitated a high standard of skill and precise timing. That success was achieved reflects the greatest credit on the ability of this officer, whose work was of a high order.

F/O. S. DEACON, D.F.C., R.A.F.V.R., No. 571 Sqn.—One night in October, 1944, this officer was the navigator in an aircraft, detailed for a mine-laying mission. The operation demanded the highest standard of skill and resolution and the success achieved is a fine tribute to F/O. Deacon's faultless work.

Act. Sqn. Ldr. K. J. NEWNAM, D.F.C., R.N.Z.A.F., No. 684 Sqn.—Since the award of the D.F.C., Sqn. Ldr. Newnam has completed many sorties and continues to show the highest standard of skill and gallantry. On a recent occasion he was detailed to reconnoitre a stretch of the Burma-Siam railway system. In spite of extremely bad weather and in the face of intense light anti-aircraft fire, Sqn. Ldr. Newnam displayed superb skill in the execution of this assignment. Almost as his task was completed, the aircraft was struck by an anti-aircraft shell which damaged the airscrew and smashed the pilot's oxygen regulator. Despite this, Sqn. Ldr. Newnam flew safely to base. He displayed outstanding determination and devotion to duty.

Act. Flt. Lt. J. A. Y. COTE, D.F.C., R.C.A.F., No. 425 (R.C.A.F.) Sqn.—This officer has completed numerous sorties since being awarded the D.F.C. He continues to display a high degree of courage and determination, and his example has been worthy of the highest praise. In September, 1944, this officer piloted an aircraft in an attack on Osnabruck. When over the target the bomber was subjected to fire from the ground defences. A shell burst very close to one of the wings. Fragments of shell tore a large hole in the fuselage, which was also pierced in many other places. Despite this, Flt. Lt. Cote pressed home his attack with great coolness and determination.

Sqn. Ldr. W. T. BROWN, D.F.C., R.N.Z.A.F., No. 76 Sqn.—Sqn. Ldr. Brown has now completed a second tour of operational duty, involving many sorties against a variety of heavily defended targets. He has displayed outstanding determination and devotion to duty, and his leadership has been of a high order. On more than one occasion his aircraft has been hit by anti-aircraft fire whilst on the bombing run. Despite this, Sqn. Ldr. Brown has pressed home his attack and flown his damaged aircraft to base.

Wing Cdr. J. B. TAIT, D.S.O., D.F.C., R.A.F., No. 617 Sqn.—Recently this officer led a formation of aircraft in an attack on the Kembs Barrage. When nearing the target considerable light anti-aircraft fire was encountered. Nevertheless, Wing Cdr. Tait led his formation into the attack with his usual skill and determination. Although his aircraft was hit and sustained damage, Wing Cdr. Tait pressed home his attack with precision. Some time previously this officer flew with great distinction in a successful attack on the Dortmund-Ems Canal. He displayed the highest standard of devotion to duty in both attacks on dangerous and difficult targets.

F/O. J. A. SANDERS, D.F.C., R.A.F.V.R., No. 617 Sqn.—In October, 1941, this officer piloted one of a formation of aircraft detailed to bomb the sluice gates of the Kembs Barrage. In the face of much light anti-aircraft fire, F/O. Sanders

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pressed home his attack with great determination. His heavy bomb fell very close to the required position. This officer has completed many sorties since being awarded the D.F.C., and has displayed the highest standard of skill and captaincy.

Act. Sqn. Ldr. R. P. TODD, D.F.C., A.F.C., R.A.F.V.R., No. 7 Sqn.—Since the award of the D.F.C. this officer has taken part in numerous operational sorties. An excellent captain of aircraft, Sqn. Ldr. Todd has invariably shown outstanding ability and a strong sense of duty. His tenacity, endurance and fine fighting spirit have materially contributed to the successes achieved by his crew.

Flt. Lt. R. L. BARTLEY, D.F.C., R.A.F.V.R., No. 627 Sqn.—Since the award of the D.F.C. Flt. Lt. Bartley has completed many successful sorties, including day and night precision bombing operations. Despite strong enemy opposition, he has always pressed home his attacks with the utmost gallantry and skill. The consistent determination and devotion to duty of this officer are worthy of high praise.

Flt. Lt. W. DOBSON, D.F.C., R.A.F.V.R., No. 429 (R.C.A.F.) Sqn.—Since the award of the D.F.C. this officer has completed many sorties on his second tour of operational duty. As a wireless operator and signals leader he has continued to display keenness, efficiency and great devotion to duty. On several occasions, by his coolness under fire, he has been of great assistance in ensuring the safe return of his aircraft. At all times this officer has proved a valuable asset to his crew.

Flt. Lt. J. R. EMMERSON, D.F.C., A.F.M., R.A.F.V.R., No. 109 Sqn.—Since the award of the D.F.C. Flt. Lt. Emmerson has completed many sorties on his second operational tour. He has consistently displayed outstanding airmanship, courage and endurance of a very high order. His fine record of achievement has set a splendid example to all.

Flt. Lt. R. E. H. FOOTE, D.F.C., R.A.F.V.R., No. 83 Sqn.—Since the award of the D.F.C. this officer has continued to display outstanding leadership as captain and pilot, the utmost determination to press home his attacks in the face of all opposition, and a praiseworthy devotion to duty. On two occasions his aircraft was heavily hit by anti-aircraft fire, and during one attack an engine was set on fire. Flt. Lt. Foote's skilful airmanship and cool courage were largely responsible for the success of both missions. Another time, in August, 1944, his aircraft took part in an attack against Konigsberg. Violent electric storms were encountered. In spite of these and severe icing, he flew his aircraft to this distant target at the allotted time and completed the mission.

Flt. Lt. N. W. F. GREEN, D.F.C., R.A.F.V.R.—Since the award of the D.F.C. this officer has flown on numerous operational sorties. On many occasions he has been intercepted by enemy fighters when far into enemy territory, but, each time, by his alertness and coolness, he has frustrated the attackers. Flt. Lt. Green's expert technical knowledge has made him a most valuable member of his squadron.

Flt. Lt. W. J. F. HILL, D.F.C., R.A.F.V.R., No. 101 Sqn.—Flt. Lt. Hill has participated in numerous successful sorties since the award of the D.F.C. He is an outstanding officer, who has always shown the utmost keenness to operate against the enemy. His constant determination and dauntless courage have set a sterling example to all members of his squadron.

Flt. Lt. R. A. M. PALMER, D.F.C., R.A.F.V.R., No. 109 Sqn.—Since the award of the D.F.C. this officer has continued to operate with unremitting zeal and enthusiasm, successfully completing a large number of operational sorties He has invariably pressed home his attacks regardless of enemy opposition, displaying courage and great devotion to duty.

Flt. Lt. W. A. SCRYMGEOUR-WEDDERBURN, D.F.C., R.A.F.O., No. 101 Sqn.—Flt. Lt. Scrymgeour-Wedderburn has an exceptionally fine record as pilot and captain of aircraft. He has flown on many operational sorties since the award of the D.F.C. His fearless courage, outstanding fighting spirit and superb skill as a pilot have won the admiration of all crews in his squadron.

Flt. Lt. A. T. SPENCER, D.F.C., R.A.F.V.R., No. 105 Sqn.—Since being awarded the D.F.C. this officer has taken part in a large number of operational sorties. In the face of intense enemy opposition and adverse weather, he has always shown exemplary courage and devotion to duty.

Flt. Lt. J. TURNBULL, D.S.O., D.F.C., R.A.F.V.R., No. 109 Sqn.—Since being awarded the D.F.C. this officer has completed a third tour of operational duty. Many of the targets attacked have been heavily defended. Throughout, his gallantry, leadership and courage have been most praiseworthy. Flt. Lt. Turnbull's keenness for operational flying has always been apparent, and has been reflected in his fine operational record.

Act. Flt. Lt. C. E. BERRY, D.F.C., R.A.F.V.R., No. 7 Sqn.—Since the award of the D.F.C. Flt Lt. Berry has participated in numerous operational sorties on many vital targets. His splendid courage and coolness in hazardous circumstances and his consistent devotion to duty are worthy of high praise.

Act. Flt. Lt. A. J. BURNETT, D.F.C., R.A.F.V.R., No. 109 Sqn.—This officer has completed his second tour of operational duty. He has participated in numerous sorties, during which he has attacked many of the very heavily defended targets in Germany. Flt. Lt. Burnett has shown himself a skilful navigator. His accuracy, courage and consistent devotion to duty have set an excellent example to all navigators.

Act. Flt. Lt. A. FLETT, D.F.C., R.A.F.V.R., No. 625 Sqn.—Flt. Lt. Flett is now on his second tour, after completing a successful and eventful first tour, during which many vital targets were attacked. Both in the air and on the ground he has set a fine standard of efficiency, leadership and indomitable courage which has been a brilliant example to all his squadron.

Act. Flt. Lt. R. JENKYN, D.F.C., R.A.F.V.R., No. 139 Sqn.—Flt. Lt. Jenkyn has continued to prove himself an outstanding navigator and set operator whose keenness, courage and devotion to duty have set a high example to all his squadron. He has a long and successful record of operational flying which has been most meritorious.

Act. Flt. Lt. G. H. R. POLSON, D.F.C., D.F.M., R.A.F.V.R., No. 97 Sqn.—Throughout his long and successful operational career, Flt. Lt. Polson has displayed great keenness and the utmost determination to operate against the enemy. He has destroyed two enemy aircraft, and his aircraft has been in combat on numerous occasions. Since the award of the D.F.C. he has participated in many further sorties. On one occasion in August, 1944, this officer's bomber was detailed to attack Konigsberg. While in the target area a Focke Wulf 190 attempted an attack. In co-operation with his captain's evasive tactics, Flt. Lt. Polson directed the fire of the mid-upper turret and his own at the enemy fighter, which caught fire, dived down out of control and was probably destroyed. His outstanding courage, devotion to duty and consistently high standard of gunnery throughout all his operations merit high praise.

F/O. T. P. JUPP, D.F.C., R.A.F.V.R., No. 83 Sqn.—Since the award of the D.F.C. this officer has flown on many more sorties; some of his targets have been amongst those most heavily defended by the enemy, including Berlin. In July, 1944, F/O. Jupp was detailed for an attack on Givors. The weather was appalling and he had to fly through a thunderstorm, but, despite this, he persisted and accomplished his mission successfully. Another time, during a daylight attack on Brest in August, 1944, this officer's aircraft was hit by anti-aircraft fire when approaching the target. With great determination he held formation rigidly, setting a fine example to the following aircraft. On yet another occasion, in the same month, F/O. Jupp's aircraft was hit while over the target and his engineer wounded. With imperturbable steadiness he completed his allotted task. At all times this officer has displayed most praiseworthy courage, determination and devotion to duty.

F/O. W. MCINTOSH, D.F.C., D.F.M., R.A.F.V.R., No. 207 Sqn.—Now on his second tour of operational duty, this officer has taken part in a large number of sorties. Since the award of the D.F.C. he has destroyed a further three enemy aircraft bringing his total victories to six enemy aircraft destroyed. On one occasion in July, 1944, F/O. McIntosh was rear gunner in an aircraft detailed for an attack on Stuttgart. While over the target area, his aircraft was attacked five times by enemy fighters. In co-operation with the mid-upper gunner, he succeeded in detroying two of the enemy fighters and in driving off the remainder. In times of stress, this officer has invariably shown great coolness, courage and a fine fighting spirit. Both in the air and on the ground he has set a high standard of efficiency.

F/O. L. C. POLL, D.F.C., R.A.F.V.R., No. 105 Sqn.—F/O. Poll has completed numerous operational sorties since the award of the D.F.C. He has at all times maintained a notable standard of skill as a navigator. F/O. Poll has displayed great courage, accuracy and devotion to duty which have won the admiration of all crews.

Act. Flt. Lt. D. MACKINTOCH, D.F.C., R.A.A.F., No. 109 Sqn.—Since the award of the D.F.C. this navigator has completed many more sorties, and, except for a short period when undergoing a conversion course, has done two operational tours without a rest period in between. Flt. Lt. Mackintoch has a keen fighting spirit and his outstanding courage, coolness and devotion to duty are worthy of high praise.

Act. Flt. Lt. H. J. A. WRIGHT, D.F.C., D.F.M., R.A.A.F., No. 582 Sqn.—Flt. Lt. Wright has participated in many operations since the award of the D.F.C. He has consistently maintained a high standard of leadership and courage both in the air and on the ground which has been a source of inspiration and encouragement to less experienced crews. His fine record of achievement has set a brilliant example to all in his squadron.

F/O. M. D. SEALE, D.F.C., R.A.A.F., No. 460 Sqn.—Now on his second tour of operations, F/O. Seale has flown on many more operational sorties since the award of the D.F.C. He has attacked some of the enemy's most heavily defended targets in Germany. In the face of intense enemy opposition, this officer has accomplished his tasks with determination, skill and courage. The excellent results obtained are a testimony to his outstanding ability.

Act. Group Capt. R. S. TURNBULL, D.F.C., A.F.C., D.F.M., R.C.A.F.—Since the award of the D.F.C., Group Capt. Turnbull has completed a second operational tour, throughout which he has consistently displayed the highest courage and tenacity of purpose. On many occasions he has pressed home his attack and successfully completed his mission under extremely difficult and hazardous circumstances. His outstanding leadership and coolness in the air, together with his initiative and exceptional ability on the ground, have set an inspiring example to all.

Act. Sqn. Ldr. R. N. QUINN, D.F.C., R.C.A.F.—Sqn. Ldr. Quinn has acted as Station Navigation Officer on many operational sorties, during which he has participated in attacks against major targets in Germany and enemy-occupied territory. He has displayed consistent keenness to operate against the enemy, inspiring leadership and outstanding navigational skill worthy of high commendation.

Act. Flt. Lt. G. H. LAING, D.F.C., R.C.A.F., No. 97 Sqn.—Since the award of the D.F.C., Flt. Lt. Laing has continued to engage the enemy with the utmost efficiency, courage and success. his aircraft has been in combat on several occa-

Wing Cdr. E. L. Fuller is awarded the American Legion of Merit for valuable work as deputy commander of the N.W. African Photographic Reconnaissance Wing.

SERVICE AVIATION

sions, on one of which one engine of his bomber caught fire, and was rendered unserviceable. Despite damage, he continued to the target, completed his mission, and flew his damaged aircraft safely back to England. His skill and unfailing devotion to duty have been most commendable.

Act. Flt. Lt. L. W. QUEALE, D.F.C., R.C.A.F., No. 405 (R.C.A.F.) Sqn.—Since the award of the D.F.C., this officer has completed many vital sorties, during which he has displayed admirable coolness under fire, together with efficiency and determination of the highest order. In addition to his excellent operational record, Flt. Lt. Queale has largely assisted in the training of less experienced navigators. His consistent devotion to duty, both in the air and on the ground, has been most praiseworthy.

Act. Flt. Lt. R. A. SWARTZ, D.F.C., R.C.A.F., No. 405 (R.C.A.F.) Sqn.—Flt. Lt. Swartz has completed two tours of operational duty. He has participated in many sorties since the award of the D.F.C. He has always shown the utmost tenacity and determination to complete all his missions with success. His high standard of efficiency, skill and devotion to duty is most commendable.

P/O. C. B. SUTHERLAND, D.F.C., R.C.A.F., No. 207 Sqn.—P/O. Sutherland is an air gunner with a fine operational record. He has participated in the destruction of seven enemy aircraft and damaged one. Three have been destroyed since the award of the D.F.C. His aircraft has been in combat on other occasions, and his accurate gunnery and coolness under fire have been outstanding. In July, 1944, the bomber in which he was flying was attacked five times by enemy fighters near Stuttgart. This officer assisted in destroying two of them and driving off the remainder.

Distinguished Flying Cross

Act. Wing Cdr. A. F. HAMILTON, R.A.F.O., No. 100 Sqn.
Sqn. Ldr. C. V. READE, R.A.F.O., No. 101 Sqn.
Act. Sqn. Ldr. J. W. ALLINSON, R.A.F.V.R., No. 106 Sqn.
Act. Sqn. Ldr. H. P. CONNOLL, A.F.M., R.A.F., No. 635 Sqn.
Act. Sqn. Ldr. E. J. GREENLEAF, D.S.O., R.A.F., No. 571 Sqn.
Act. Sqn. Ldr. C. W. C. HAMILTON, R.A.F.V.R., No. 625 Sqn
Act. Sqn. Ldr. L. HATCHER, A.F.M., R.A.F.V.R., No. 83 Sqn.
Act. Sqn. Ldr. D. L. HUGHES, R.A.F.V.R., No. 239 Sqn.
Act. Sqn. Ldr. R. G. St. C. WADSWORTH, R.A.F.V.R., No. 692 Sqn
Flt. Lt. J. F. JENKINS, R.A.F.V.R., No. 156 Sqn.
Flt. Lt. D. F. MCKEE, R.A.F., No. 77 Sqn.
Flt. Lt. E. OAKES, R.A.F.V.R., No. 207 Sqn.
Flt. Lt. D. A. PEACOCK, R.A.F.O., No. 582 Sqn.
Flt. Lt. R. H. PERKS, R.A.F.V.R., No. 239 Sqn.
Flt. Lt. H. W. TAYLOR, R.A.F.V.R., No. 218 Sqn.
Act. Flt. Lt. H. G. BENNETT, D.F.M., R.A.F., No. 7 Sqn.
Act. Flt. R. W. BRUMWELL, R.A.F.V.R., No. 75 (N.Z.) Sqn.
Act. Flt. Lt. E. JENKINS, D.F.M., R.A.F.V.R., No. 105 Sqn.
Act. Flt. Lt. J. VERNEY, M.B.E., R.A.F.V.R., No. 35 Sqn.
F/O. G. J. BATE, R.A.F.V.R., No. 630 Sqn.
F/O. R. BROWN, D.F.M., R.A.F.V.R., No. 218 Sqn.
F/O. H. F. BRUNDLE, R.A.F.V.R., No. 7 Snq.
F/O. L. COEN, R.A.F.V.R., No. 106 Sqn.
F/O. G. D'ARCY, R.A.F.V.R., No. 426 Sqn.
F/O. J. E. GIBBS, D.F.M., R.A.F.V.R.
F/O. J. GINGLES, D.F.M., R.A.F.V.R., No. 617 Sqn.
F/O. D. GRAY, R.A.F.V.R., No. 434 (R.C.A.F.).
F/O. J. P. HUMPHREYS, R.A.F.V.R., No. 97 Sqn.
Sqn. Ldr. A. V. WILLIS, D.F.M., R.A.A.F., No 460 (R.A.A.F.) Sqn.
Act. Flt. Lt. N. N. PARKER, R.A.A.F., No. 97 Sqn.
F/O. J. C. BLACK, R.A.A.F., No. 35 Sqn.
F/O. F. N. DAVIS, R.A.A.F., No. 50 Sqn.
F/O. D. J. DOBINSON, R.A.A.F., No. 462 (R.A.A.F.) Sqn.
F/O. R. HOBBS, R.A.A.F., No. 83 Sqn.
Act. Sqn. Ldr. M. S. STRANGE, D.S.O., R.C.A.F., No. 427 (R.C.A.F.) Sqn.
Flt. Lt. W. A. TROW, R.C.A.F., No. 434 (R.C.A.F.) Sqn.
Flt. Lt. W. J. L. WEICKER, R.C.A.F., No. 405 (lt.C.A.F.) Sqn.
Act. Flt. Lt. G. L. GONYON, R.C.A.F., No. 428 (R.C.A.F.) Sqn.
Act. Flt. Lt. J. G. M. E. REGIMBALD, R.C.A.F., No. 425 (R.C.A.F.) Sqn.
F/O. R. C. BENNET, R.C.A.F., No. 626 Sqn.
F/O. K. E. BLY, R.C.A.F., No. 57 Sqn.
F/O. H. H. CAMPBELL, R.C.A.F., No. 427 (R.C.A.F.) Sqn.
F/O. H. B. GUILFOYLE, R.C.A.F., No. 576 Sqn.
F/O. B. JOHNSTON, R.C.A.F., No. 115 Sqn.
Flt. Lt. M. R. HEAD, D.S.O., R.N.Z.A.F., No. 514 Sqn.
Act. Flt. Lt. W. M. STRATHERN, R.N.Z.A.F., No. 138 Sqn.
F/O. J. K. AITKEN, R.N.Z.A.F., No. 75 (N.Z.) Sqn.
Act. Sqn. Ldr. D. A. DUNCANSON, R.C.A.F., No. 144 Sqn.
Act. Sqn. Ldr. R. G. W. OAKLEY, D.F.M., R.A.F.V.R., No. 627 Sqn.
Flt. Lt. J. L. POWEL, R.C.A.F., No. 144 Sqn.
Flt. Lt. A. C. GALLACHER, R.A.F.V.R., No. 141 Sqn.
P/O. G. MCLEAN, R.A.F.V.R., No. 141 Sqn.
Act. Flt. Lt. P. G. BROWN, R.N.Z.A.F., No. 115 Sqn.
Act. Flt. Lt. A. J. OSBORNE, R.A.F.V.R., No. 115 Sqn.
Act. Flt. Lt. R. HUTCHINSON, R.A.A.F., No. 578 Sqn.
F/O. H. W. DALTON, R.A.F.V.R., No. 578 Sqn.
F/O. M. H. EXTON, R.A.F.V.R., No. 144 Sqn.
P/O. W. L. MCGOWN, R.A.F.V.R., No. 514 Sqn.
F/O. R. E. AMEY, R.A.F.V.R., No. 50 Sqn.
P/O. R. H. BODE, D.F.M., R.A.F.V.R., No. 161 Sqn.
P/O. S. J. BRISTOW, R.A.F., No. 44 Sqn.
P/O. G. B. BUSS, R.A.F.V.R., No. 77 Sqn.
P/O. G. D. CHESWORTH, R.A.F.V.R., No. 207 Sqn.
Flt. Lt. A. H. A. MCBAIN, R.C.A.F., No. 424 (R.C.A.F.) Sqn.
Flt. Lt K. I. R MILLIGAN, R.C.A.F., No. 7 Sqn.
Flt. Lt. J. PEDEN, R.C.A.F., No. 97 Sqn.
Flt. Lt. J. M. SNELGROVE, R.C.A.F., No. 434 (R.C.A.F.) Sqn.
Flt. Lt. H. SMITH, R.C.A.F., No. 405 (R.C.A.F.) Sqn.
Wing Cdr. P. A. LOMBARD, R.A.F., No 228 Sqn
Flt. Lt. N. CARR, R.A.F.V.R., No. 143 Sqn.
Flt. Lt. A. R. CUSSONS, R.A.F.V.R., No. 540 Sqn.
Flt. Lt. A. H. W. GILCHRIST, R.A.F.V.R., No. 143 Sqn.
Flt. Lt. A. F. WALLACE, R.A.F.V.R., No. 220 Sqn.
Flt. Lt. C. C. W. MARGERISON, R.C.A.F., No. 571 Sqn.
Act. Flt. Lt. P. A. MURPHY, R.A.F.V.R., No. 156 Sqn.
F/O. J. BLURING, R.A.F.V.R., No. 578 Sqn.
F/O. J. Y. J. COTE, R.C.A.F., No. 425 (R.C.A.F.) Sqn.
F/O. G. CRIBB, R.A.F.V.R., No. 16 Sqn.
F/O. J. J. DUNNE, R.A.A.F., No 9 Sqn.
F/O. S. P. MCGEE, R.C.A.F., No. 571 Sqn.
F/O. A. E. MACNAUGHTON, R.C.A.F., No. 578 Sqn.
Act. Flt. Lt. W. R. DENNIS, R.A.F.V.R., No. 158 Sqn.
F/O. L. E. J. DAY, R.A.F.V.R., No. 158 Sqn.
F/O. D. B. FREEBORN, R.C.A.F., No. 153 Sqn.
F/O. B. W. MCCOSKER, R.A.A.F., No. 466 (R.A.A.F.) Sqn.
Flt. Lt. L. G. MASON, R.N.Z.A.F., No. 33 Sqn.
Act. Flt. Lt. W. J. ANDERSON, R.C.A.F., No. 419 (R.C.A.F.) Sqn.
Act. Flt. L. V J. MCFARLANE, D.F.M., R.A.A.F., No. 33 Sqn.
F/O. J. L. ALLAN, R.C.A.F., No. 198 Sqn.
F/O. R. J. CAMMOCK.
F/O. V. C. DOHANEY, R.C.A.F., No. 430 (R.C.A.F.) Sqn.
F/O. G. E. A. HARDY, R.C.A.F., No. 198 Sqn.
F/O. T. R. WHELER, R.C.A.F., No. 411 (R.C.A.F.) Sqn.
W/O. (now P/O.) O. D. EAGLESON, R.N.Z.A.F., No. 486 (N.Z.) Sqn.
F/O. C. G. THOMPSON, R.A.A.F., No. 455 (R.A.A.F.) Sqn.
P/O. J. M. COCHRANE, R.C.A.F., No. 433 (R.C.A.F.) Sqn.
P/O. C. J. L. SMITH, R.A.A.F., No. 455 (R.A.A.F.) Sqn.

Distinguished Flying Medal

Sgt. G. W. LANE, R.A.F.V.R., No. 50 Sqn.
Flt. Sgt. M. BRENNAN, R.A.F.V.R., No. 83 Sqn.
Flt. Sgt. G. BROWN, R.A.F.V.R., No. 97 Sqn.
Flt. Sgt. W. CHRISTIE, R.A.F.V.R., No. 578 Sqn.
Flt. Sgt. A. J. B. FROST, R.A.F.V.R., No. 44 Sqn.
Flt. Sgt. J. GRAHAM, R.A.F.V.R., No. 576 Sqn.
Flt. Sgt. D. A. GRAY, R.A.F.V.R., No. 460 (R.A.A.F.) Sqn.
Flt. Sgt. G. S. HAZELTINE, R.A.F.V.R., No. 83 Sqn.

Army Awards

THE KING has been graciously pleased to approve the following awards in recognition of gallant and distinguished services in the field:—

Military Cross

Lt. (Act. Capt.) E. J. B. GRAY, Army Air Corps.

THE KING has been graciously pleased to approve the following awards in recognition of gallant and distinguished services in Italy:—

Distinguished Flying Cross

Capt. (temp Maj.) T. B. LAIRD, Royal Regiment of Artillery.
Lt. (temp. Capt.) J. R. APPLEBY, Royal Regiment of Artillery.
Lt. (temp. Capt.) W. B. GIBB, Royal Regiment of Artillery.
Lt. (temp. Capt.) R. M. GORHAM, Royal Regiment of Artillery.
Lt. (temp. Capt.) F. M. JONES, Royal Regiment of Artillery.
Lt. (temp. Capt.) G. T. LEWORTHY, Royal Regiment of Artillery.
Lt. (temp. Capt.) F. S. TANNER, Royal Regiment of Artillery.

Foreign Decoration

THE KING has granted unrestricted permission for the wearing of the undermentioned decoration conferred upon the airman indicated in recognition of valuable services rendered in connection with the war:—

Conferred by the President of the Czechoslovak Republic

Bronze Medal of Merit (2nd Class)

Flt. Sgt. B. NIEUWENHUYS, R.A.F.V.R.

Roll of Honour

Casualty Communiqué No. 459.

THE Air Ministry regrets to announce the following casualties on various dates. The next of kin have been informed. Casualties "in action" are due to flying operations against the enemy; "on active service" includes ground casualties due to enemy action, non-operational flying casualties, fatal accidents and natural deaths.

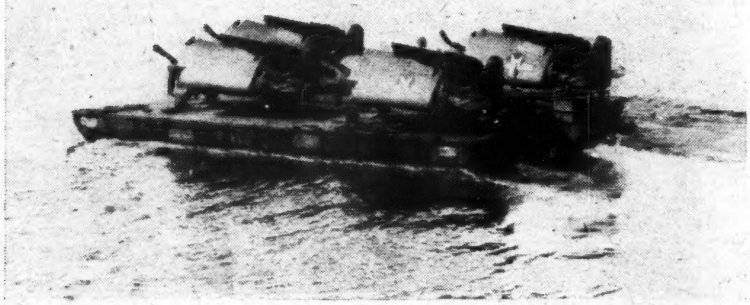
Of the names in this list 72 are second entries giving later information of casualties published in earlier lists.

Royal Air Force

KILLED IN ACTION.—F/O. P. G. Cable; Sgt. H. W. Causley; P/O. W. H. Cockburn; Sgt. C. B. Hill; F/O. B. J. Honey; Flt. Sgt. A. H. Lovell; Sgt. D. L. D. Moon; Sgt. L. O'Brien; Flt. Sgt. J. Thomas.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—F/O. F. J. Blake; Sgt. L. F. Bostock; F/O. R. Burrell; Flt. Sgt. W. A. Casey; Sgt. G. C. Connon; Sgt. W. D. R. Davies; Flt. Sgt. P. G. Fletcher; Sgt. L. F. Somers; Sgt. H. P. Thomas; Sgt. P. J. A. Tuppen.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—F/O. G. Ainsworth; P/O. A. H. Blackmore; Sgt. P. W. Booth; Sgt. H. J. R. Brookman; Flt. Sgt. F. E. Burton-Burgess; Sqn. Ldr. A. F. Chisholm; Flt. Lt. J. P. Crebbin, D.F.C.; Flt. Sgt. S. J. Davis; Sgt. S. V. Domleo; Flt. Sgt. H. T. Evans; Flt. Sgt. W. E. Flubow; Flt. Sgt. C. Frost; Sgt. G. Haw-



FIGHTER FERRY: Four of the latest FM-2 Wildcats of the U.S. Navy are ferried ashore from a carrier in the S.W. Pacific. A taller fin and rudder form the chief feature of this improved Wildcat.

good; Wing Cdr. R. Hilton, D.S.O., D.F.C.; Flt. Lt. E. L. Lister; Sgt. T. H. R. McKeag; Sgt. D. MacKenzie; P/O. B. J. Saville; Sgt. N. G. Speight; Sgt. E. J. Takle; Flt. Sgt. B. G. Tucker; Flt. Lt. A. G. Warren; Sgt. G. Wood; Act. Sqn. Ldr. R. J. S. Wootton, D.F.C.; Sgt. H. A. Wright; Flt. Lt. J. Wright.

WOUNDED OR INJURED IN ACTION.—W/O. J. Cartwright; Sgt. H. J. Chorlton; F/O. F. Hartwright; Flt. Sgt. J. O. Kirk.

DIED OF WOUNDS OR INJURIES RECEIVED IN ACTION.—Flt. Sgt. M. L. Knight; F/O. D. Phillips, D.F.C.; Flt. Lt. L. J. Rowell; Flt. Sgt. I. A. Weeks; P/O. H. S. Wiltshire.

MISSING, BELIEVED KILLED IN ACTION.—Flt. Lt. J. H. Brown; D.F.C.; F/O. W. T. David; Flt. Lt. A. J. Hay, D.F.C.; F/O. D. S. Monard.

MISSING.—Sgt. C. C. Addems; F/O. L. S. Ajrekar; Sgt. E. W. Allen; Flt. Sgt. F. Allen; W/O. E. L. Armitage; Sgt. R. Ashworth; Sgt. C. E. Baines; F/O. P. J. Baker; Sgt. G. J. Baldwin; Flt. Sgt. D. A. Barnes; Flt. Sgt. R. Bensley; Flt. Sgt. R. W. Bishop; Flt. Sgt. R. Boyle; Sgt. C. A. Byng; Sgt. J. P. Callan; F/O. C. Carter; Sgt. H. H. M. Connolly; Sgt. J. Crawford; Sgt. R. W. Davies; Sgt. W. E. Davies; Flt. Sgt. D. C. Dawson; F/O. A. K. M. Dean; F/O. E. A. Duerr; W/O. G. Dugdale; Sgt. J. A. B. Finch; Sgt. P. J. Gallivan; Sgt. B. Gantz; Sgt. D. P. Gates; F/O. A. E. Gidley; Sgt. R. Gough; Act. Flt. Lt. P. Green; W/O. S. Greig; Sgt. T. Hamilton; Sgt. N. Hayward; Sgt. D. M. Herbert; P/O. N. Hesketh; Sgt. C. Heydon; Sgt. G. C. Hinves; Flt. Lt. T. C. Hood; Sgt. N. Huntley; Sgt. N. Hustwaite; Sgt. J. McA. Hutchens; Sgt. H. J. Hutchinson; Sgt. L. P. James; Flt. Lt. T. R. Jenkins; Sgt. W. O. Kenyon; Sgt. P. King; Sgt. F. S. Knight; Flt. Sgt. R. Lee; Sgt. C. J. R. MacDougall; W/O. W. S. M. McKean; Sgt. R. MacLeod; Sgt. L. Maiden; Sgt. A. A. R. Metcalfe; Sgt. S. K. Morrison; Sgt. K. P. R. Motley; P/O. H. D. Murray; W/O. A. E. Nicholls; Flt. Sgt. W. Nixon; Flt. Sgt. K. W. Pithouse; W/O. F. F. Pitt; Sgt. E. Pook; Flt. Sgt. H. J. Potter; Flt. Sgt. D. M. Quarendon; Sgt. J. E. Richardson; F/O. R. E. Richardson; F/O. K. R. Rogers, D.F.C.; Flt. Lt. H. Scholfield; F/O. E. I. Scott; Sgt. J. H. Senior; Wing Cdr. A. F. M. Sisley; W/O. N. F. Slade; Sgt. C. Small; F/O. D. Tabor; Sgt. W. C. Tatum; Sgt. P. J. Taylor; Sgt. F. Thackery; Flt. Sgt. H. G. Thomas; Sgt. E. Thompson; Sgt. R. E. Tibbles; Sgt. F. H. Truffett; Act. F/O. E. Walton; Sgt. P. H. C. Ware; Sgt. R. H. Watts; Flt. Sgt. J. Whittaker; Flt. Sgt. E. H. Wood; Sgt. J. Wooller.

KILLED ON ACTIVE SERVICE.—Sgt. E. C. Alsop; F/O. W. Auld; Sgt. G. A. Bennett; P/O. D. J. Blackmore; Sgt. H. A. A. Bodin; L.A/C. R. K. Brookfield; Sgt. J. Butterfield; Sgt. G. I. Callow; Flt. Sgt. C. S. Cameron; Sgt. W. Campbell; Sgt. J. E. Clarke; A/C.1 A. J. Cooke; Sgt. T. S. Diggin; Sgt. E. W. A. Dunford; Sgt. G. Firth; F/O. K. W. Fox; Flt. Sgt. V. J. Fryer; P/O. H. Garthwaite; Sgt. J. D. Greensmith; Flt. Lt. B. Grimshaw; Sgt. T. C. Guthrie; F/O. J. V. Hudson; Sgt. J. B. Iles; Flt. Lt. A. C. Jonas; Sgt. F. R. Jones; L.A/C. J. E. Kennedy; Flt. Lt. P. W. Leah; Sgt. N. M. Malpass; F/O. F. N. O'Brien; Sqn. Ldr. J. F. Pettigrew; W/O. J. N. Philpott; Cpl. J. P. H. Strachan; F/O. J. G. Sutherin; Flt. Sgt. W. E. Sweetapple; Sgt. D. S. Thompson; Sgt. A. F. M. Trimby; Flt. Lt. J. E. L. Waring; W/O. R. A. Whyte; Act. Sqn. Ldr. G. A. Wilson, D.F.C.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED ON ACTIVE SERVICE.—Sgt. R. L. Ditchfield; F/O. D. C. Gannaway; Sgt. M. W. Grover.

WOUNDED OR INJURED ON ACTIVE SERVICE.—Sgt. S. D. Allingham; L.A/C. E. Brockbank; Flt. Sgt. J. A. Firth; Sgt. K. Harrop; Act. Sqn. Ldr. J. C. Nelson, A.F.C.; A/C.2 R. Usher; Act. Sqn. Ldr. S. G. Vickers.

DIED OF WOUNDS OR INJURIES RECEIVED ON ACTIVE SERVICE.—L.A/C. W. H. Buckland; Flt. Sgt. R. N. Ericksen.

DIED ON ACTIVE SERVICE.—F/O. T. G. Atkinson; Sgt. D. Batson; Sgt. R. J. Bell; Sgt. W. W. Cannell; L.A/C. W. H. Dumbrill; Cpl. A. A. T. Dunmore; Flt. Sgt. H. Hodgson; L.A/C. R. P. Jones; L.A/C. J. D. Kevan; L.A/C. W. H. Naylor; Sgt. E. C. W. Newton; Act. Sqn. Ldr. R. C. Parry; L.A/C. J. M. Roberts; L.A/C. W. G. Sercombe; F/O. R. T. C. Wade; Act. Flt. Lt. A. J. Wheatland.

Royal Australian Air Force

KILLED IN ACTION.—P/O. F. W. Moss.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Flt. Sgt. C. G. Hoskin.

MISSING, BELIEVED KILLED IN ACTION.—F/O. F. R. M. Cook.

MISSING.—Flt. Sgt. A. N. J. Billing; Flt. Sgt. R. V. Boyd; Flt. Sgt. R. J. Bucirde; Flt. Sgt. P. G. Caddy; F/O. D. O. Connolly; P/O. B. L. J. Foley; Act. F/O. K. M. Hutchins; F/O. J. S. Leigh; Flt. Sgt. R. J. Mullins; Act. Wing Cdr. G. Panitz, D.F.C.; Flt. Lt. R. S. Williams, D.F.C.; Flt. Sgt. R. Yabsley.

KILLED ON ACTIVE SERVICE.—P/O. D. J. Black; F/O. M. Cox; Flt. Sgt. S. G. Jacobs; Flt. Sgt. J. P. Mansell; Flt. Sgt. K. Panwick; Flt. Sgt. C. B. Schuller; P/O. L. G. Walker; Flt. Sgt. R. Walmsley; W/O. J. A. White.

Royal Canadian Air Force

KILLED IN ACTION.—F/O. J. S. Colville; P/O. F. L. Maw.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—Sgt. J. McL. Adamson; F/O. J. W. Wiley.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Flt. Sgt. G. E. Aitken; F/O. E. J. Andrews; Flt. Sgt. J. H. Barkwell; Flt. Lt. L. A. Bourgeois; F/O. J. R. Carswell; F/O. R. G. Carter, D.F.C.; W/O. W. P. Coleman; Flt. Lt. I. L. Colquhoun; F/O. T. H. Donnelly, D.F.M.; F/O. E. H. Douglas; F/O. A. J. Ellis; P/O. G. A. Graham; P/O. J. D. Lynch; F/O. E. T. McDermott; Sgt. O. M. McIntyre; P/O. R. W. Nixon; P/O. S. Noble; Flt. Sgt. A. Veraas; Act. Flt. Lt. W. J. Weston.

MISSING, BELIEVED KILLED IN ACTION.—F/O. R. J. Currie; F/O. C. E. Fairfield; F/O. R. A. Porritt; Flt. Lt. W. K. Scharff.

MISSING.—Flt. Sgt. H. Backler; Flt. Sgt. B. G. H. R. Bean; F/O. S. L. Braaten; P/O. G. A. Bullock; W/O. J. Carswell; F/O. R. W. Easton; P/O. R. E. Good; Flt. Lt. D. H. Gross; P/O. G. F. Humphrey; W/O. J. H. Inch; Flt. Sgt. N. T. James; Flt. Sgt. L. Johnston; F/O. J. A. Neilson; F/O D. A. Ryerse; Sgt. H. P. Veregin; F/O. D. G. C. Wilson; F/O. J. H. Wilson; Sgt. J. F. Yacko.

KILLED ON ACTIVE SERVICE.—F/O. R. L. Chambers; F/O. L. E. Chapman; F/O G. W. Davidson; F/O. B. Deane-Freeman; Cpl. W. R. Dickson; F/O. W. R. Eaglestone; Sgt. H. R. W. Fox; Flt. Lt. C. W. Gaines; F/O. D. A. Gordon; F/O. R. Greavison; Sgt. E. Henley; F/O. J. H. Hudson; P/O. M. Kram; F/O. P. P. Loszchuk; Flt. Lt. A. H. A. McBain; Wing Cdr. J. G. McNeill, D.F.C.; Sgt. J. W. Mitchell; Sgt. R. C. Morrison; Sgt. R. C. Pegg; P/O. W. S. Ross; Flt. Lt. G. E. Steel-Davies; W/O. S. C. Walker; Sqn. Ldr. B. E. Wilmot, D.F.C.; P/O. T. E. Wiltse.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED ON ACTIVE SERVICE, NOW PRESUMED KILLED ON ACTIVE SERVICE.—F/O. H. P. Ralph.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED ON ACTIVE SERVICE.—F/O. G. N. Rattee.

WOUNDED OR INJURED ON ACTIVE SERVICE.—P/O. K. J. Davies.

DIED ON ACTIVE SERVICE.—F/O. L. J. D. Di Marco; Sgt. P. E. Normandeau; P/O. E. A. Taylor, D.F.M.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER OF WAR.—P/O. E. C. Brewer; P/O. J. A. Hillman; P/O. M. M. Hoffberg; P/O. C. H. McIlwain; W/O. D. R. Nelson; P/O. W. F. Nicholls; P/O. R. J. Renneberg; W/O. D. MacM. Smith, D.F.M.; F/O. E. W. Strauss.

Royal New Zealand Air Force

KILLED IN ACTION.—Flt. Sgt. K. G. Curtis; Flt. Sgt. W. R. Lewis.

DIED OF WOUNDS OR INJURIES RECEIVED IN ACTION.—Flt. Lt. L. J. Montgomerie, D.F.C.

MISSING.—Flt. Sgt. W. H. J. Barnes; Flt. Sgt. E. B. Davies; Flt. Sgt. C. J. H. Falconer; Flt. Sgt. J. Fitzgerald; Flt. Lt. A. Mews; Flt. Sgt. H. C. Resy; Flt. Sgt. H. G. Walters; Flt. Sgt. W. D. Watson.

DIED OF WOUNDS OR INJURIES RECEIVED ON ACTIVE SERVICE.—Flt. Sgt. J. C. Wilson.

South African Air Force

KILLED IN ACTION.—Maj. R. H. F. Howarth, D.F.C.; Lt. M. U. C. McIntyre.

WOUNDED OR INJURED IN ACTION.—Lt. H. P. S. Fairweather; W/O. I. G. P. Van Wielingh.

DIED OF WOUNDS OR INJURIES RECEIVED IN ACTION.—Lt. J. R. Salmond.

MISSING, BELIEVED KILLED IN ACTION.—2/Lt J. C. Hoyle.

MISSING.—Lt. D. Krynaux; Lt. C. K. Mouton; 2/Lt. S. Schneider.

KILLED ON ACTIVE SERVICE.—Lt. P. B. Franklin.

DIED ON ACTIVE SERVICE.—W. Rouselle.

Air Vice-Marshal J. B. Cole-Hamilton, C.B., C.B.E. (left), looks on while Sqn. Ldr. J. A. Plagis, D.S.O., D.F.C. and Bar, presents pilots of the Persian Gulf Squadron to Lady H. C. Fowle. The occasion was the presentation to the squadron of six Spitfires from the Persian Gulf Spitfire Fund.

Casualty Communiqué No. 460

Of the names in this list 73 are second entries giving later information of casualties published in earlier lists.

Royal Air Force

KILLED IN ACTION.—Sgt. D. J. K. Baron; F/O. G. Cross; Flt. Sgt. R. M. Housden; Flt. Sgt. A. MacFarlane; Flt. Sgt. K. J. Mooney.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—Sgt. R. W. Allen; Sgt. J. P. Gray; F/O. R. L. Hughes; F/O. W. J. James; Sgt. J. E. F. Paton; Sgt. F. E. A. Rivett; Sgt. W. A. Wall.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Sgt. H. A. S. Addison; F/O. A. Barker; Sgt. J. L. Barrett; F/O. F. M. Baxter; Sgt. F. H. Bloomfield; F/O. G. G. Booth; Sgt. A. Buchan; Sgt. J. M. Carruthers; Flt. Sgt. C. Chapman; Flt. Sgt. F. L. Chapman; Flt. Sgt. D. E. L. Crosse; P/O. T. J. Gosling; F/O. H. O. Hetterley; P/O. O. L. R. Hills; Sqn. Ldr. D. O. Hobbis, D.F.C.; F/O. M. H. King; Act. Sqn. Ldr. W. J. Lewis, D.F.C.; Sgt. G. A. Litchfield; Sgt. M. J. Lynch; P/O. D. C. J. McKendry; Sgt. J. McMillan; Sgt. R. F. Moody; Act. Flt. Lt. G. J. B. Neil; Sgt. M. J. O'Donovan; Flt. Sgt. L. R. Ott; Sgt. D. M. Pearson; Flt. Sgt. J. G. Potter; Act. Flt. Lt. R. D. Rayfnent; Sgt. L. L. Richards; F/O. A. J. Trenerry; Sgt. K. Watmough; P/O. A. McO. Watson; Sgt. C. W. D. Watts; Sgt. L. Webb; Sgt. J. E. Whitehead; Sgt. F. G. Williamson; Sgt. F. J. Wooldridge; Flt. Sgt. W. A. Young.

WOUNDED OR INJURED IN ACTION.—Sgt. R. Hicks.

MISSING, BELIEVED KILLED IN ACTION.—Flt. Sgt. D. J. Fitzgerald; Flt. Sgt. R. C. Fitzgerald; Flt. Sgt. V. Hinder; Sgt. A. J. Seares.

MISSING.—Sgt. S. W. Allen; Flt. Sgt. V. Ansell; F/O. R. C. C. Atkins; Sgt. P. Baguley; P/O. C. R. H. Baker; Sgt. H. G. Baker; Flt. Sgt. L. S. Baldwin; Sgt. S. S. Barnett; Sgt. W. S. Barton; Sgt. T. Barton; Flt. Sgt. G. Boag, D.F.M.; W/O. J. J. Bonfield; Sgt. J. C. Bracegirdle; Act. F/O. G. Bradburn; Sgt. J. W. Briers; F/O. R. O. Brigden; Flt. Sgt. A. T. Britchford; Wing Cdr. N. B. P. Bromley, O.B.E.; Sgt. R. E. Brunsdon; Flt. Sgt. P. Burt; Flt. Sgt. R. Cadman; Act. F/O. D. Campbell; Sgt. B. MacM. Catley; Sgt. G. J. J. Caulfield; Flt. Sgt. H. D. Chappell; Sgt. C. A. Clarke; Sgt. F. H. Davidson; Flt. Lt. F. J. Dec; Sgt. E. R. Dore; Sgt. A. H. Dunning; W/O. J. P. Edwards; Sgt. E. E. Evans; Sgt. J. M. Evans; Flt. Sgt. J. Farnworth; Sgt. F. J. Feakins; Sgt. A. J. Ford; Act. Wing Cdr. G. P. Gibson, V.C., D.S.O., D.F.C.; Sgt. J. Gilfillan; Sgt. L. P. Gower; Sgt. H. G. Hamilton; Sgt. J. B. Hamilton; Act. F/O. R. N. Hansell; Flt. Lt. M. F. C. Harding; Flt. Sgt. F. R. Harmsworth-Smith; Flt. Sgt. R. J. Hayden; F/O. F. F. Hebditch; Sgt. R. T. Hill; Sgt. W. A. Holt; Sgt. J. S. Holdcroft; Flt. Sgt. J. Horsford; Sgt. T. N. Howe; Sgt. A. A. Hull; Sgt. F. W. L. Hunwick; Flt. Sgt. L. Irlam; Sgt. J. D. Jarvis; Flt. Sgt. K. J. Jewell; Sgt. D. Jones; Sgt. G. B. Jones; F/O. S. E. Jones; Flt. Sgt. T. J. Jones; Sgt. A. G. Kerr; Flt. Sgt. M. Kieff; Sgt. J. S. Kinsey; Act. Sqn. Ldr. H. P. Lee-Warner; Sgt. J. Letts; Flt. Sgt. G. T. Levick; Act. Sqn. Ldr. H. C. Lobb; Sgt. H. O. Lowbridge; P/O. H. Lupton; F/O. J. W. McDonald; Sgt. J. G. McEwan; Sgt. C. McGarry; Flt. Lt. P. D. K. MacGlashan; Sgt. A. J. McNamara; Sgt. N. G. McSporran; Flt. Sgt. W. J. Manley; Sgt. D. G. Marchant; Flt. Sgt. P. O. Mayfield; F/O. H. C. B. Merry; Flt. Sgt. W. J. Mintjens; Sgt. C. G. Nash; Sgt. W. G. Nisbett; F/O. W. Nixon; Flt. Sgt. R. E. North; F/O. G. W. Palmer; Act. Sqn. Ldr. S. M. P. Parkes; Sgt. J. R. Plant; P/O. V. J. E. Pink; Flt. Sgt

R. C. Pitcon; Flt. Sgt. H. B. Pounder; Sgt. D. C. Prior; F/O. B. L. Purkis; Sgt. J. D. Reid; Flt. Sgt. J. McD. Reid; F/O. G. E. J. Reynolds; Sgt. K. J. Roberts; F/O. K. S. Robinson; P/O. F. W. Rogers; F/O. J. R. Rosser; Sgt. J. P. Rowley; Sgt. W. C. Sadler; P/O. M. Savage; Flt. Sgt. E. Schofield; Sgt. W. H. Slater; W/O. E. Smith; F/O. F. J. Smith; F/O. W. Snowden; Flt Sgt. A. N. Taylor; Sgt. H. Thomson; F/O. R. Toomer; Flt. Lt. P. V. Truscott; Sgt. J. J. Turner; Sgt. H. Twell; Flt. Sgt. I. C. Vaughan; Act. Flt. Lt. J. B. Warwick, D.F.C.; P/O. C. G. Washington; W/O. J. C. Watson; P/O. J. White; Flt. Sgt. J. White; F/O. C. B. Whitmore; Sgt. D. Williamson; Wing Cdr. B. B. Willmott; Act. Flt. Lt. G. Wilson, D.S.O., D.F.C., D.F.M.; P/O. H. Wilson; F/O. J. Yeoman.

KILLED ON ACTIVE SERVICE.—Sgt. R. G. Alexander; Sgt. W. H. J. Bell; Flt. Lt. K. W. Bishop; Sgt. A. Blewett; Act. P/O. W. H. Cheale; F/O. D. De V. Clarke; Flt. Lt. H. F. J. P. Conry; Flt. Sgt. M. F. J. Cox; Flt. Sgt. W. E. J. Cox; Sgt. D. D. Evans; Sgt. D. J. Fortune; W/O. A. A. Graham; W/O. L. Grimshaw; Flt. Sgt. E. Hall; Sgt. W. E. Hankin; Flt. Lt. S. D. Harrison; Sgt. R. R. Hesketh; F/O. D. J. Hill; P/O. H. J. Holmes; Sgt. A. Hughes; W/O. E. I. H. Jones; Sgt. J. Lambell; Sgt. G. E. Manning; Sgt. F. S. Martin; L.A/C. H. D. Matthews; Cpl .N. R. Morris; Sgt. J. S. A. Nicholson; Sgt. D S. Norman; F/O. H. G. Payne; Sgt. D. Sheen; Sgt. C. V. Short; Sgt. A. D. Smith; Flt. Sgt. A. A. South; Sgt. C. Taylor; Sgt. C. D. R. Verrier; Sgt. L. E. B. Walker; F/O. L. C. Watts; Sgt. T. H. Westhead; Sgt. J. M. P. H. G. Weyemberg.

WOUNDED OR INJURED ON ACTIVE SERVICE.—Sgt. R. E. Tyler; Sgt. C. M. Weaver.

DIED OF WOUNDS OR INJURIES RECEIVED ON ACTIVE SERVICE.—Sgt. P. A. Anderson; Flt. Sgt. K. Haigh; L.A/C. V. E. Lewis; P/O. A. J Welham.

DIED ON ACTIVE SERVICE.—Sgt. W. A. Breach; Sgt. C. J. Brereton; Sgt. K. A. D. Fackrell; A/C.2 P. Haralambous; L.A/C. J. Illingworth; Act. Cpl. G. P. Stephens; F/O. R. Stringer.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW REPORTED PRISONER OF WAR.—Flt. Sgt. R. Prinn.

PREVIOUSLY REPORTED MISSING NOW REPORTED PRISONER OF WAR.—Sgt. C. W. T. Case; Flt. Sgt. L. J. A. Casey; Flt. Sgt. A. Collins; Flt. Sgt. R. Favager; Flt. Lt. S. F. Jefferson; Sgt. J. S. Martin; Flt. Sgt. H. J. Rouse; Flt. Sgt. D. J. Salt; Flt. Sgt. A. W. G. Waters.

Women's Auxiliary Air Force

DIED ON ACTIVE SERVICE.—Act. S/O. N. U. Gillingham; L.A/CW. E. M. Thomlinson.

Royal Australian Air Force

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—P/O. K. G. Whitting.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Flt. Sgt. L. P. Barber; Flt. Sgt. R. E. Brook; Flt. Sgt. S. M. Close; Flt. Sgt. V. Collins; Act. Sqn. Ldr. E. G. M. Corser, D.F.C.; W/O. J. Craner; Flt. Sgt. J. E. Francis; Flt. Sgt. J. Gilvarry; Flt. Sgt. J. Joiner; Flt. Sgt. V. E. Lawson; Flt. Sgt. J. A. H. May; Flt. Sgt. D. S. Nest; Flt. Sgt. R. J. Paull; Flt. Sgt. L. S. Smith; P/O. R. H Watts; Flt. Sgt. R. C. Williams

MISSING.—Flt. Sgt. L. A. Eunson; Flt. Sgt. T. Adcock; W/O. F. W. White.

KILLED ON ACTIVE SERVICE.—Flt. Sgt. P. D. Arthur; Flt. Sgt. A. L. Currie; Flt. Sgt. C. J. Deutscher; W/O. E. R. Gadsden; Flt. Sgt. R. A. Groves; Flt. Sgt. L. G. Thurling; Flt. Sgt. R. W. Tuck; P/O. B. G. Wilkinson.

WOUNDED OR INJURED ON ACTIVE SERVICE.—Flt. Sgt. T. E. Hennessy; Sgt. R. W. McDougall; Flt. Sgt. G. E. Simpson.

Royal Canadian Air Force

KILLED IN ACTION.—W/O. D. C. T. Jones; P/O. M. J. C. H. Leduc; P/O. M. E. Millar.

DIED OF WOUNDS OR INJURIES RECEIVED IN ACTION.—W/O. J. K. Brown.

MISSING, BELIEVED KILLED IN ACTION.—F/O. J. C. Holder.

MISSING.—Flt. Sgt. J. E. Fitzgerald; F/O. F. E. Good; F/O. H. R. Good; Flt. Lt. F. J. Halcro; W/O. G. F. Harrison; P/O. W. J. Hope; P/O. W. N. Irving; F/O. D. R. Jones; Flt. Sgt. E. Kisilowsky; Flt. Lt. T. J. Martin; P/O. R. B. Nairn; Flt. Sgt. J. A. Perdue; Flt. Sgt. P. Peters; Flt. Lt. J. E. Porter; Flt. Sgt. C. O. Powell; W/O. L. H. Rogers; F/O. W. Ross; F/O. J. B. Russell; Flt. Sgt. J. Schafer; P/O. S. Simm; Flt. Lt. G. W. Taylor; P/O. R. Wilson; P/O. H. De Le B. Young.

KILLED ON ACTIVE SERVICE.—Sgt. D. M. Paterson; F/O. N. E. Trusty; Flt. Lt. A. J. Smith.

WOUNDED OR INJURED ON ACTIVE SERVICE.—P/O. J. L. Staples.

PREVIOUSLY REPORTED MISSING, NOW PRISONER OF WAR.—Sgt. E. F. Gillcash.

SERVICE AVIATION

Royal New Zealand Air Force

MISSING.—P/O. R. S. Barker; W/O. R. J. Braddock; Flt. Sgt. J. R. Court; W/O. R. Firth; Flt. Sgt. W. G. Norton; F/O. M. J. Steel; P/O. J. K. Stellin; P/O. H. W. Uru.

KILLED ON ACTIVE SERVICE.—Sgt. W. S. Barton; W/O. J. R. Harvey; Flt. Sgt. L. A. McMillan.

South African Air Force

MISSING.—Lt. A. E. Dickson; Lt. A. E. Farrow; Lt. R. A. Hargrave; Lt. F. G. Rees; Lt. P. J. Welman.

Casualty Communiqué No. 461

Of the names in this list 75 are second entries giving later information of casualties published in earlier lists.

Royal Air Force

KILLED IN ACTION.—Sgt. W. Bryce; Flt. Lt. E. Goy; P/O P. C. M. Hellegers; F/O. N. L. Jefferson; Sgt. W. G. Jeffery; F/O. L. G. Purcell; Sgt. G. H. Richold; Sgt. H. E. Smith; P/O. E. Spencer; Sgt. K. J. Stewart; Sgt. J. L. B. Trotman; Sgt. P. S. Withers; Sgt. B. P. Wood.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—Sgt. S. O. J. Boxshall; Sgt. G. B. Bradley; F/O. J. R. Ferguson; Flt. Sgt. K. A. Humphries; Sgt. H. Johnson; W/O. L. Lawrence; Sgt. E. W. Pritchard; Act. Wing Cdr. E. Pullen; Sgt. G. H. Reveley; Sgt. J. L. Selkirk; Sgt. E. A. Stokes; Sgt. R. S. Ward.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—P/O. C. H. Bayram; Sgt. D. J. Bealey; Act. W/O. J. E. Bellamy; Sgt. E. Birchill; Sgt. D. W. Blackman; F/O. R. S. Bowden; Sgt. H. Brown; Sgt. R. G. Brown; F/O. I. A. C. Campbell; Flt. Sgt. P. E. J. Carmichael; Sgt. K. T. Cooper; Flt. Sgt. N. F. Dixon; Sgt. G. A. England; Sgt. W. Fraser; P/O. C. M. Handley; Sgt. H. C. Haslan; Act. Flt. Lt. C. F. Horner; Flt. Sgt. R. J. Hudson; F/O. R. W. Johnson; P/O. T. H. Knight; Flt. Sgt. L. R. B. Matthews; Flt. Sgt. D. A. Mills; F/O. C. E. Oakley; Sgt. T. M. Robbins; Sgt. A. D. Roulson; Sgt. R. G. Sharp; Act. Sqn. Ldr. R. G. F. Stewart, D.F.C.; Sgt. D. J. Symonds; Flt. Sgt. F. Thorington; Sgt. R. H. Tomlin; Sgt. S. W. Whitney; Sgt. R. W. Wilmott; Sgt. E. G. Wyatt; Sgt. A. R. C. Yeatman.

WOUNDED OR INJURED IN ACTION.—F/O. D. Beaton; Sgt. D. F. C. Hopkins; Sgt. P. Malcolm; Sgt. M. D. E. Molony.

DIED OF WOUNDS OR INJURIES RECEIVED IN ACTION.—Sgt. R. F. Recabarren; Sgt. H. F. Rhodes.

MISSING, BELIEVED KILLED IN ACTION.—Flt. Sgt. H. T. Wise.

MISSING.—Sgt. A. J. Alden; Sgt. W. C. Alderson; Sgt. J. C. Alexander; Sgt. P. Barr; Sgt. M. Bell; Sgt. N. Beswick; Flt. Sgt. H. F. Bolt; Sgt. R. J. Boorman; F/O. T. B. Booth; F/O. B. J. Boston; Sgt. A. E. J. Bosworth; Act. Flt. Lt. E. G. W. Bowers; Sgt. J. G. Bradford; W/O. F. P. W. Bray; Sgt. W. G. Brockett; Sgt. H. W. Brotherhood; P/O. J. F. Butson; Sgt. N. D. Challis; F/O. D. J. Christensen; Sgt. R. E. W. Clark; Sgt. T. S. Clay; Act. Flt. Sgt. D. Cobb; Sgt. K. P. Coote; Sgt. P. Corrigan; Sgt. E. J. Cottridge; F/O. T. R. Court; Flt. Lt. F. N. Crane; Flt. Sgt. A. Dobson; Sgt. G. B. Donaldson; Sgt. H. W. Douglas; Flt. Sgt. R. Dowson; Flt. Lt. P. J. Edwards; Flt. Sgt. D. E. Evans; Flt. Sgt. P. E. Evans; Sgt. R. D. Faint; Flt. Sgt. A. J. Foster; Sgt. W. France; Sgt. E. A. Gillespie; Sgt. D. A. Godden; Flt. Sgt. M. G. Godfray; W/O. W. D. T. Halstead; Flt. Sgt. E. V. Hammond; F/O. R. S. Hancox; Flt. Sgt. H. P. Hawtin; Flt. Sgt. H. W. Hobden; F/O. D. H. Holdsworth; F/O. J. Hulme; Sgt. G. McP. Jack; Flt. Sgt. S. Jenkins; Sgt. A. G. Kenebel; W/O. W. E. Kinsey; Sgt. E. Lancaster; Sgt. A. A. M. Langridge; F/O. D. Laycock; Sgt. P. J. Leather; Sgt. P. J. Leighton; Sgt. L. Letten; Sgt. K. V. Logan; Sgt. G. S. Lowson; Act. Flt. Lt. O. J. Meggeson; Sgt. E. L. Meredith; Flt. Sgt. I. G. C. Miller; Sgt. T. Moffat; P/O. W. E. Moore; Act. F/O. J. E. Morgan; Flt. Lt. C. L. Morris; Flt. Sgt. R. R. C. Morris; Sgt. D. A. Nelson; Flt. Sgt. L. E. Newman; F/O. D. F. O'Sullivan; Flt. Sgt. F. C. Owen; W/O. P. F. C. Pearn; F/O. A. J. Pritchard; Sgt. H. Randall; Sgt. C. Rennie; Sgt. K. V. Ritchie; Sgt. L. Rudd; F/O. A. Scott; Sgt. A. Scviour; F/O. C. D. Shaw, D.F.M.; W/O F. G. C. G. Shirley; F/O. M. Sims; Sgt. R. E. Snelling; Sgt. G. R. Stott; Sgt. J. Sutcliffe; Flt. Sgt. K. Tempest; F/O. R. Tetlow; Sgt. L. Thompson; Sgt. R. Tomkinson; P/O. A. R. Tomlinson; Sgt. J. Tulloch; Flt. Sgt. N. Twell; F/O. J. J. Walsh; F/O. W. G. E. F. Walton, B.E.M.; Sgt. H. Ward; Sgt. G. E. Waren; F/O. L. Whetton; P/O. C. A. White; Flt. Sgt. E. C. Whittall; F/O. E. J. Wicker; Act. Sqn. Ldr. A. L. Williams; Act Flt. Sgt. A. K. Wooliscroft; Flt. Sgt. E. Young.

MISSING, BELIEVED KILLED ON ACTIVE SERVICE.—L.A/C. T. H. Osborne; F/O. R. C. Tourell.

KILLED ON ACTIVE SERVICE.—Flt. Sgt. C. G. R. Adams, D.F.M.; Sgt. R. H. Breach; Flt. Lt. L. G. Butt; Sgt. J. A. Coughtrey; Sgt. J. R. Davenport; Sgt. R. Davidson; Sgt. I. Dearing; Cpl. J. W. Flint; A/C.2 J. O. Gallagher; Sgt. S. D. Gingold; Cpl. J. A. Goodhew; Sgt. E. Henshall; Sgt. R. Hughes; P/O. J. Johnstone; Flt. Sgt. F. Marvin; Sgt. K. Mitchell; A/C.1 E. J. Parker; Sgt. J. J. Poston; Sgt. T. E. Rhodes; Flt. Sgt. T. Robinson; W/O. W. M. Robinson; Sgt. B. Sandall; Flt Sgt. E. Smith; Act. Sqn. Ldr. R. E. S. Smith, D.F.C.; Sgt. P. Terry; Sgt. F. J. Ward; W/O. K. D. Ward; Flt. Sgt. S. C. Williams; F/O. C. N. Woodcock.

WOUNDED OR INJURED ON ACTIVE SERVICE.—W/O. R. O. Edwards; Sgt. B. Jones; Act. Sqn. Ldr. F. Pilling; Sgt. W. Toole.

DIED ON ACTIVE SERVICE.—Sgt. K. E. Ascombe; Sgt. G. Brown; A/C.2 F. Collen; A/C.1 S. Desmond; Cpl. J. H. Durward; Sgt. J. A. Lane; A/C.1 M. Seale; A/C.2 B. C. Wildbore.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER OF WAR.—P/O. J. E. Bunyan; Flt. Sgt. K. Davies; Flt. Sgt. C. O. Gibbons; Flt. Sgt. L. E. Newbold; Flt. Sgt. W. Pearson; Sgt. D. F. Wooldridge.

Royal Australian Air Force

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—Flt. Sgt. P. J. Edwards; P/O. A. F. Nairn; Flt. Sgt. T. P. O'Hare.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—F/O. G. L. Backmore; Act. Flt. Lt. M. S. Fletcher; Flt. Sgt. R. R. Godfrey; F/O. S. J. Hansen; Flt. Sgt. A. A. Harris; Sgt. T. M. Judd; Flt. Sgt. F. Knight; Flt. Sgt. D. A. McCord; Flt. Sgt. D. C. Meyer; Act. Flt. Lt. L. B. Patkin; Flt. Sgt. H. D. Scott; Flt. Sgt. A. B. Slade; Flt. Sgt. N. J. M. Veale; F/O. J. D. West; Flt. Sgt. M. G. Western; F/O. E. O. S Williams.

WOUNDED OR INJURED IN ACTION.—Act. Flt. Lt. J. Howard.

MISSING.—Flt. Sgt. R. A. Ashton; Flt. Sgt. N. E. Barnes; P/O. W. S. Baxter; W/O. W. J. Carrier; Flt. Sgt. R. Coates; Flt. Sgt. B. D. Dyer; P/O. D. R. Fisher; P/O. L. J. Grey; Act. F/O. R. B. Hardie; Flt. Sgt. W. E. Hathaway; Flt. Sgt. S. J. Hayes; W/O. C. L. Hughes; Flt. Sgt. J. P. Ion; W/O. R. Le Gay Brereton; Flt. Sgt. G. W. McLeod; Flt. Sgt. M. J. Mahar; Act. F/O. W. J. Moran; Flt. Sgt. G. A. Shoesmith; Flt. Sgt. M. Stanley.

KILLED ON ACTIVE SERVICE.—P/O. J. L. Bairstow; Flt. Sgt. W. D. Fawcett; Sgt. D. G. Grant; Flt. Sgt. I. H. Jones; Flt. Sgt. A. D. McIntyre.

Royal Canadian Air Force

KILLED IN ACTION.—Flt. Sgt. H. F. Anderson; P/O. C. Axford; F/O. I. Kirschner; F/O. W. A. Milner; F/O C. P. Pesme.

WOUNDED OR INJURED IN ACTION.—F/O. P. E. Gariepy.

MISSING, BELIEVED KILLED IN ACTION.—F/O. J. McV. Flood.

MISSING.—Flt. Sgt. A. J. Anderson; W/O. D. R. Barnard; F/O. R. G. Bradley; P/O. H. C. Braun; P/O. H. A. Burt; Flt. Lt. E. R. Church; F/O. A. K. Cuddy; Flt. Sgt. J. D. Duffin; Flt. Sgt. W. J. Fingland; F/O. G. Flegel; Flt. Sgt. A. R. Jackson; P/O. F. Kohut; P/O. W. A. Langrill; F/O. A. W. Larsen; F/O. J. A. Linklater; Flt. Sgt. H. L. McKay; Flt. Sgt. B. McLaughlin; F/O. F. K. Morley; Flt. Sgt. F. E. Morton; Flt. Sgt. R. N. Smith; Flt. Sgt. V. Stear; Flt. Lt. B. K. Wiley; Flt. Sgt. T. Yates.

KILLED ON ACTIVE SERVICE.—F/O. V. H. Bolton; F/O. N. E. Cousins; Sgt. B. G. Kitchen; F/O. W. E. J. McBain; Sgt. J. C. McMurtrie; F/O. J. R. Pound; Sgt. R. J. Sander; F/O. E. O. Smith; F/O. M. E. Vande Kinder; Sgt. K. A. Watson; F/O. W. F. Woolgar.

DIED ON ACTIVE SERVICE.—Flt. Sgt. C. K. Bateman.

Royal New Zealand Air Force

KILLED IN ACTION.—Act. Flt. Lt. W. B. Smaill, D.F.C.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—F/O. I. W. Hall; Flt. Sgt. R. H. Sinclair; W/O. R. Swift.

MISSING, BELIEVED KILLED IN ACTION.—Flt. Sgt. P. G. Bignell.

MISSING.—Flt. Sgt. G. R. Trafford; F/O. L. T. Whitaker; W/O. J. L. T. Williams, D.F.M.

South African Air Force

MISSING.—2/Lt. D. G. Browne; Lt. A. Costhuizen; Lt. R. A. Evans; Lt. E. V. Hopping-Mills.

KILLED ON ACTIVE SERVICE.—Lt. D. E. McDonald; Sgt. T. Marr; 2/Lt. F. S. Mulder.

DIED OF WOUNDS OR INJURIES RECEIVED ON ACTIVE SERVICE.—Lt. S. L. Parr.

Air Transport Auxiliary

First Officer Robert Graham Morris, A.T.A., KILLED whilst ferrying His Majesty's aircraft in England.